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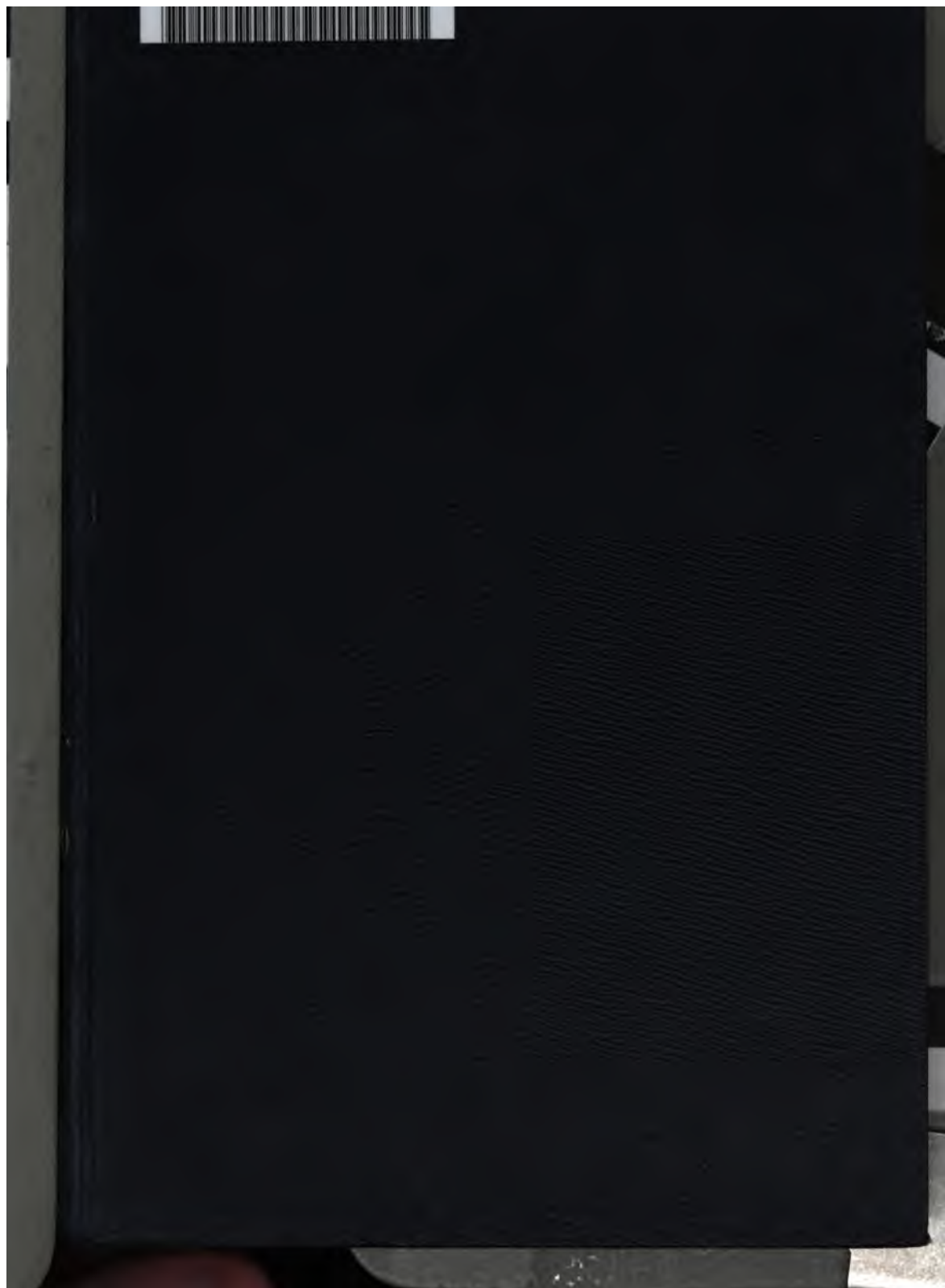
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PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
OF LONDON.



VOL. IV.

SESSION 1859-60.

Nos. I. to V.

EDITED BY DR. NORTON SHAW.

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PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY
OF LONDON.

SESSION 1859-60.

First Meeting, Monday, November 14th, 1859.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

ELECTIONS.—*Professor Otto Struve, of the Imperial Observatory of Pulkova, St. Petersburg, as a Corresponding Member; and Sir Edward Borough, Bart.; the Rev. Charles Oakley, M.A.; Lord Henry Scott; and Henry Duckworth; George Gammie; Charles Maret, and Francis Tagart, Esqrs., were elected Fellows.*

ACCESSIONS.—The accessions to the Library and Map Rooms since the former Meeting were numerous, and the following were among the more important:—Alberdi's *Organizacion de la Confederacion Argentina*; Schrenck's *Reisen und Forschungen im Amúr-Lande, 1854-56*; *Beiträge zur Kenntniss des Russischen Reiches* (vols. 7, 9, and 19); *Reisen in Central Afrika von Mungo Park bis auf Drs. Barth und Vogel* (vol. 1); Crowther and Taylor's *Niger Expedition, 1857-59*; Hall's *Manual of South African Geography*; *Report of the Geological Survey of Canada*; Long's *Early Geography of Western Europe*; Kupffer's *Annales de l'Observatoire Physique Centrale de Russie*; and the *Transactions of Geographical and Scientific Societies at home and abroad*. Maps and Charts of the Zambesi, Shire, and Lake Shirwa, from Dr. Livingstone; 1331 Ordnance Maps, 76 Admiralty Charts; Warren's Map of the United States, from the Mississippi to the Pacific; Palmer's Map of the Island of St. Helena; Sprent's Map of Tasmania; Government Maps of Sardinia, Papal States, Algeria, Belgium; Views and Maps of the Seat of War in Italy; Papen's *Höhen-Schichte Karte von Central Europa*; Keith Johnston's *Royal Atlas*, and Blackie's *Imperial Atlas*, in continuation, &c.

EXHIBITIONS.—The Model of the Schooner *Fox*, and the 'Record' of the Franklin Expedition, with the case in which it was enclosed, found by Commander Hobson, on King William Island, were exhibited.

SIR R. MURCHISON, on taking the Chair, and introducing Captain M'Clintock to the audience, expressed his regret that the Earl of Ripon, the President of the Society, was prevented from being present in consequence of the death of his relative Earl de Grey, adding that, of all occasions, this was one on which the noble Earl would have most desired to be present.

The Paper read was—

Discoveries by the late Expedition in Search of Sir John Franklin and his Party. By CAPTAIN F. L. M'CLINTOCK, R.N.

THE object of the expedition, commanded by Captain M'Clintock, was to complete the search for Franklin, in the area of nearly 300 miles square, still left unexplored, and lying between the following boundaries :—On the north the tracks of Ross, Austin, and Belcher ; on the west Collinson and M'Clure ; on the south Rae and Anderson ; and on the east the west shores of Boothia.

Captain M'Clintock left Aberdeen, in the *Fox*, on July 17, 1857. His ship was beset by ice between Melville Bay and Lancaster Sound, on August 18th, and, together with the ice, he drifted back again down the middle of Davis Strait, during 242 days' imprisonment, as far as lat. 63° 30', a distance of no less than 1194 geographical miles. Being, at length, released by the breaking up of the ice, under circumstances of great peril, Captain M'Clintock recommenced his voyage towards the north. He touched at the Greenland settlements, crossed Melville Bay, and reached Pond Inlet on July 27th. Here he found Esquimaux, who had heard of Rae's expedition, but had no knowledge whatever of the country west of Repulse Bay ; no rumours of Franklin's expedition had reached them. Sailing onwards, Beechey Island, the scene of Franklin's first winter, was reached on August 11th, and Bellot Strait on August 20th. This strait separates the extreme northern point of the American continent from North Somerset. It is faced by high granite rocks, and strong tides sweep through it. It was traversed on September 6th, but the expedition was compelled to take up winter quarters at its eastern entrance.

Early spring sledging journeys were commenced on February 17th of this present year, the outline of the American continent was completed, and the first rumours of Franklin's expedition were obtained from the Esquimaux. Early in April the long projected spring journeys were fairly commenced. Three parties were made up, headed respectively by Captain M'Clintock, Lieutenant Hobson, and Captain Young. Each of these gentlemen had a party of four or five men drawing a sledge, and was also accompanied by an auxiliary sledge drawn by dogs.

Captain Young explored the coast-line between the extreme

points reached by Lieutenants Osborn and Browne in 1851, and also from Bellot Strait northwards to Sir J. Ross's farthest, in 1849, but found no trace of the lost expedition. In order to complete these extensive discoveries he sent back four out of his five companions, and, with one seaman and a few dogs, continued his explorations for forty days longer.

Captain M'Clintock searched the eastern shores of King William Land and found Esquimaux who were able to afford precise intelligence. They had seen the white men of Franklin's party upon their march, and had visited the abandoned ship, but stated that very little remained of it above water when they last saw it, about a year since. Captain M'Clintock pushed on until his route overlapped that of Anderson and Stewart in 1855 and, as it afterwards proved, he travelled there at precisely the same season, viz., May, that the crews of Franklin's party were on their march, consequently he saw the country exactly as they saw it, and had the best opportunity of discovering cairns or other remains left by them. Little, however, was to be found. Simpson's Cairn, on Cape Herschel, was examined; it appeared to have been disturbed, and it was believed that records had been deposited there by Franklin's party, but had been subsequently removed by the Esquimaux. A skeleton was also passed, with papers and clothing that identified him as a sailor.

Lieutenant Hobson was more successful in his search. He soon came to unequivocal traces of the lost expedition. A large cairn with tents, blankets, and other remains of a station, was discovered, but no papers could be found. Subsequently he passed other cairns, and latterly one which contained a record of the party, secured in a tin case. By it we have been informed that in May, 1847, all was well on board the *Erebus* and *Terror*; that, in the year 1845, the same year in which they left England, they ascended Wellington Channel to lat. 77° , and returned southward by the west of Cornwallis Island, and spent their first winter at Beechey Island. On the 12th Sept., 1846, they were beset in lat. $70^{\circ} 5'$, long. $98^{\circ} 23'$, and here, in the packed ice, about 15 miles off the N.W. shore of King William Island, they passed their second winter. Lieutenant Gore and Mr. des Vœux, with a party of six men, landed and deposited the above record, and another exactly similar, which Lieutenant Hobson found in a small cairn one day's march farther south. Round the margin of the former of these documents much additional information was given, under date of the 25th of April, 1848.

The ships, it states, were abandoned on the 22nd of April, 1848,

about 15 miles to the N.N.W., consequently they had drifted southward only 12 or 14 miles in twenty months. The survivors, 105 in number, under the command of Captain Crozier, landed at this spot, and built the cairn which now exists, upon the site of Ross's cairn, which must have been taken down by the Esquimaux.

Sir John Franklin died on the 11th of June, 1847, and the total loss by deaths in the expedition, up to the date of their landing, was 9 officers and 15 men.

They had intended proceeding on the morrow for Back's Fish River. The record was signed by Crozier, as Captain of H.M.S. *Terror*, and senior officer; also by Fitzjames, as Captain of H.M.S. *Erebus*.

The numerous remains found by this cairn, showed how greatly the retreating party had overrated their capabilities of transport. For they had here thrown away stores of all kinds; everything in fact that was not absolutely indispensable. Lieutenant Hobson continued his explorations nearly to Cape Herschel, leaving records of what he had seen to guide Captain M'Clintock, on that gentleman's return journey. At one day's march, N.E. of Cape Crozier, and 65 miles from where Franklin's ships had been abandoned, Lieutenant Hobson and Captain M'Clintock severally fell in with one of the Franklin expedition boats, with clothing, watches, religious books, &c., and two skeletons in her. This boat had evidently been prepared and fitted up with the greatest care, for the ascent of the Back River. There were some chocolate and tea in store, but no biscuit or meat. On close examination the boat proved to have been abandoned, not when going from, but when returning towards the ship. Captain M'Clintock supposed when the strength of the party who took her out began to fail, and it was found impracticable to drag the boat farther, that the more vigorous pushed on and left the weaker to return to the ship, for further supplies.

No Esquimaux had visited these shores since the disaster, as was obvious from the numerous articles of priceless value, in their eyes, that lay about untouched. It was truly fortunate they had not visited the cairn which contained the record found by Lieutenant Hobson, for, if so, they would have assuredly destroyed it. The Esquimaux were found to have disturbed, and almost wholly pulled down, the principal cairns left by other expeditions.

The whole western shore of King William Island was patiently examined no less than three times, but the wrecks of the abandoned ships were not discovered. Captain M'Clintock concludes as follows:—

“After mature consideration upon all that I have seen I am of

opinion that the abandonment of the *Erebus* and *Terror* had been contemplated for months previously to its execution; also, that the whole crew had become affected by scurvy, and greatly debilitated. We know that Franklin's ships were cut off from all supplies of game for three consecutive winters, and that this is the *only case on record* of ships' crews subsisting *solely* upon their own supplies for so long a period.

The *Investigator* was abandoned after the third winter, but her crew had been able to procure some valuable supplies of fresh food, consisting of game of different sorts, including about 100 reindeer. She lost only three men in this period, yet the whole crew were affected by scurvy.

But the *Erebus* and *Terror*, before being abandoned, had lost 24 officers and men, and therefore I conclude that the remainder of their crews were *at least* as seriously affected as were the people of the *Investigator*.

There are two important questions which have been so frequently asked me, that I gladly avail myself of this opportunity of offering some explanation upon so deeply interesting a subject.

The first question is—Whether some of the 105 survivors may not be living amongst the Esquimaux? The various families or communities of Esquimaux met with by Rae, Anderson, and myself, at different times and places, all agree in saying, 'No, they *all* died.' But let us examine for ourselves.

The western shore of King William Island, along which they were compelled to travel for two-thirds of their route, is uninhabited, and all that is known to us of the mouth of the Back River, is derived from the journeys of Back, Simpson, Anderson, and myself; none of us have met natives there, consequently it is fair to conclude that the Esquimaux but seldom resort to so inhospitable a locality.

In fact their life is spent in a struggle for existence, and depends mainly upon their skill in taking seals during the long winter—a matter which requires such long training, that no European has ever yet succeeded in acquiring it.

My two Greenland Esquimaux tried various methods at Bellot Strait, yet did not succeed; and without dogs trained to scent out the small breathing holes of the seals, through the ice and through the snow, which overlays the ice and conceals them from observation, I do not think that even the Boothian Esquimaux could live. It requires not only that a man should possess a trained dog, but that he himself should be so well trained in the only successful mode of seal hunting in this locality in order to subsist.

It is, therefore, evidently an error to suppose that where an Esquimaux can live, a civilized man can live there also. Esquimaux habits are so entirely different from those of all other people, that I believe there is no instance on record of either a white man or an Indian becoming domesticated amongst them, or acquiring tolerable expertness in the management of a kayak.

With regard to the probability of procuring the means of subsistence independently of the Esquimaux, I will just state what was shot by my own sledge party—and we never lost a chance of shooting any thing—during the journey along the lands in question, that occupied us for 79 days, and covered nearly 1000 geographical miles of distance. The sum total amounted to 2 reindeer, 1 hare, 17 willow grouse, and 3 gulls.

The second question is—Why have the remains of so few of our lost countrymen been found?

It is indeed true that only 3 of the 105 were discovered; but we must bear in mind that from the time they left their ships they were dragging sledges and boats, and, therefore, they must have travelled almost constantly upon the ice—not upon the land—consequently all traces or remains there vanished with the summer thaw of 1848.

There is no doubt that many relics still remain strewed along the uninhabited shore of King William Island, beneath the snow, but as it was most carefully examined three times over, I cannot think that any conspicuous object, such as would be put up to indicate where records were deposited, could possibly have escaped us.

The summer at Port Kennedy proved a warm one, yet the ice did not permit us to move until the 9th of August, and the object of the expedition having been attained, we commenced our homeward voyage.

On the 21st of September I arrived in London, having landed at Portsmouth, and on the 23rd the dock-gates at Blackwall closed behind the *Fox*."

The CHAIRMAN said, that it was with no slight emotion that he rose to say a few words on this subject. When his illustrious friend Sir John Franklin, who was then a Vice-President of the Royal Geographical Society, sailed in 1845 on his last expedition, he (Sir R. Murchison) looked forward with hope to his return to fill the place of President, which he then occupied.

The Government of the United States, and individual citizens of that country, Mr. Grinnell, Mr. Peabody, and others had supported the search for our countrymen, but sought in vain. The most distinguished of our Arctic explorers (several of whom he now saw around him), including Admiral Austin, Sir Edward Belcher, Captain Collinson, Captain Sherard Osborn, Captain Kellett, and many more eminent seamen had also sought in vain for that record which had been so happily discovered by the last

expedition, and which had revealed to us, for the first time, the discoveries and fate of Franklin. That certainly was a triumph for the British nation, and we must all rejoice that it has been accomplished by the devotion and energy of an Englishwoman. To Lady Franklin must be accorded the great praise of having never desisted in her efforts until she had sent out a fourth expedition, none of those undertaken by the Government having been successful; and the success which she obtained in such a cause was as great an honour as ever fell to the lot of an Englishwoman.

He would not enter into any analysis of the views which Captain M'Clintock had put forth in so clear and able a manner. He would only announce that a work was forthcoming, which he (Sir R. Murchison) had had the privilege of reading, in which would be narrated in a much more attractive manner—for his intrepid friend had not done justice to himself in the very brief abstract he had read to the meeting—the marvellous perils he and his associates had undergone.

Two of Captain M'Clintock's distinguished comrades now sat near him, Captain Hobson and Dr. Walker, whose exploits are well described in the narrative of Captain M'Clintock. There is a fourth member of the expedition whose modesty has induced him to conceal himself in some corner of the room—Captain Allen Young—a gentleman, who, leaving the merchant marine and a lucrative command, threw not only his own services into this venture, but also subscribed 500*l.* towards carrying it into practical effect.

To geographical science the results of Captain M'Clintock's expedition were little less than glorious, for, among other results, it had determined for the first time the navigability of Bellot Strait, and proved its southern shore to be the northernmost headland of the American continent. By examining the west coast of Boothia to the Magnetic Pole, and thence down to the mouth of the Back River, he had demonstrated that if ever a ship shall complete the north-west passage it will be by that route. In the forthcoming narrative the difficulties which those gallant men had surmounted would be presented to the world in detail. The very first incident of their voyage in a little yacht of only 170 tons, was, that when they had penetrated to Melville Sound in Baffin Bay, they were frozen up for the winter, and then drifted back in ice 1200 geographical miles into the Atlantic. But they returned to the charge, and eventually succeeded for the first time in revealing the fate of the illustrious Franklin and his associates. There was no doubt that Franklin proceeded farther to the north in a *ship* than any of the navigators who went in search of him up Wellington Channel—and then he returned by performing that extraordinary voyage round Cornwallis Island, by which, in the first year of his enterprise, he proved it to be an island completely separated by a navigable channel from Bathurst Island.

SIR EDWARD BELCHER, R.N., F.R.G.S., coinciding generally with what had been stated by Captain M'Clintock, still felt it a duty to make a few remarks on the *supposed course* which Sir J. Franklin had adopted, and, commencing with his passage up the Wellington Channel, believed, from the documents found, that he must have reached as far as the north-western horn of Crescent Island; and he believed he stated the opinion of those who accompanied him, that Sir J. Franklin could not have proceeded farther.

He (Sir Edward) could get no farther, but his expedition was blocked up in a similar manner. He had delayed a little to raise a cairn and leave notices on the summit of Cape Perry, during which interval the ice closed from the westward and blocked further progress; otherwise, indeed if he had been forty-eight hours earlier, he might have passed into open water, and possibly have passed out at Behring Strait, or beyond the northern limits of Asia.

When, at that period, he viewed the ice pressed up heavily at the north-west horn of Crescent Island, he thought that any vessel subjected to such pressure, would be destroyed. But later experience, and that also which had befallen the *Resolute* and *Fox*, satisfied him that, by keeping well off the shore, such a danger would easily be avoided. Because, after travelling beyond Crescent Island, his travelling party had passed over a great deal of ice far to the north and west, free from the land, and found it to be the simple smooth floe—nothing but ordinary ice—and he much regretted that he had not been, unfortunately, as he might term it, forced to make his way by that northern channel. However, they were barred, probably much in the same manner as Franklin had been.*

But he must now remark on his (Sir John Franklin's) good fortune in finding his way back the same season, and he attributed this to Franklin either taking the northern side of Wellington Channel by Cape Becher, and sending his consort by the south, or *vice versa*, and by that means discovered the channel between Cornwallis and Bathurst Islands; otherwise it was impossible for Franklin, according to the *supposed* track drawn in the Admiralty Chart (now before him), to have discovered any channel by which he would have so daringly ventured, but must have returned by the same route by which he went up.

He (Sir Edward) then proceeded to explain the second attempt of Sir John Franklin in the summer of 1846. His instructions were "to proceed from $74^{\circ} 15' N.$ and $98^{\circ} W.$, and attempt a passage to the *w.s.w.* from Cape Walker." He would, therefore, after passing that position, experience the full tidal influence of the southerly set down Byam Martin Channel—the very set which had pressed the *Resolute* towards that southern bight of Melville Sound; and it is also apparent on the chart that the depths increase greatly southward. He would be driven by the full force of that tide, which, in conjunction with that setting south-east between Melville and Banks Land, formed the *true flood-tide* for the Great Fish River, pressing directly south-east down that channel, and forcing the heavy ice on to the opposing angle, Cape Felix of King William Land, where the constant pressure of direct flood and counter eddy of ebb would for ever hamper his vessels.

Here he would remark, that the evidence of Captain Sir James Ross, of Lieutenant Browne, of Captain Pullen, and lastly of Captain M'Clintock, in their examinations of Peel Strait did not afford the slightest evidence of either *current, tide, or motion of any description* to justify an opinion of that ice having ever been in motion. No pack was noticed, not even the customary disruption caused by motion past the islets. Whence then, the huge masses of ice pressed down on King William Land? If any strong tide through Peel Strait had existed, then it would have cleared away the ice from Cape Felix, and driven it south-westerly during the summer of 1847. But no; the great and constant pressure was from the great open water to the north-west through the now termed M'Clintock Channel.

If Sir John Franklin had been aware of the discoveries of Rae and Collinson, and stuck to the shore near Gateshead Island, he might have passed into Vic-

* The Chairman was understood to say, that Franklin had navigated farther north in open water in Queen Channel than any other navigator. We have no evidence of this beyond the mere record found, which probably assumed within a few miles the 77th degree of latitude. Even if he determined it *afloat*, the doubt as to sea horizon would be sufficient to vitiate the question. But the *Pioneer* was navigated up to Crescent Island, and Sir E. Belcher in his gig navigated up to the *N.E.* horn of Crescent Island, beyond the 77th degree; and there, too, the *Pioneer* might also have been placed, if necessary.—P. 88 and 97, vol. i., last Arctic Voyages.—E. B.

toria Strait. For we find in Rae's Journal that he waited at Admiralty Inlet, I think, two days, in the hope of being able to reach the cairn erected by Sir J. Ross, then only 40 miles east of him.*

Lastly, as to the probable state of the M'Clintock Channel, he could not help coming to the conclusion that all the evidence, particularly that of Osborn, leads us to infer that the region of M'Clintock Channel is at times open, and his sledge journal, during Austin's expedition, tends to confirm motion of the ice. Thus, we may observe all the heavy ice was noticed near Osborn's farthest. The pressed up ice clearly proved outside motion. He noticed what he mistook for loom of land: its bearing had changed the next day. To my mind, he saw only the *water sky*, which does present at a distance a dull bluish loom like land. The gravel banks also observed off shore might be attributed to up-turned floe, which carried on it the gravel of the bottom where it had grounded. The only *measured depth* near the shore which he had seen recorded was 7 fathoms; but no vessels, seeing such pressed up ice near the shore, would attempt to close on such inevitable danger.

CAPTAIN R. COLLINSON, V.P.R.G.S., said,—Among the important results brought home by Captain M'Clintock is the interesting fact, that a discrepancy occurs in accounting for the crews of the *Erebus* and *Terror*, and nine men are still unaccounted for. Had he been in the position of Captain Crozier at the end of the second year, he should have been prompted to send a boat to the Mackenzie River to warn the Hudson Bay Company that assistance was wanted, and this may afford a clue to the grave at Point Warren. This view is still further borne out by the piece of wood he picked up on the Finlayson Islands. The general set of the current through the Dolphin and Union Strait being to the eastward, there is every probability that it was either left on the island itself or dropped to the westward of it.

Twice previous to the finding of this piece of wood he visited the Finlayson Islands and encamped within 20 feet of the spot where it was found, a fact which will show how important it is in order to afford a complete elucidation of the mystery attending the fate of our countrymen, that the search should be made when the snow has melted, in the months of July, August, and September.

He now came to the abandonment of the ships by the crews: at that period travelling with sledges had not been brought to anything like the perfection it has since attained, and when he considered that sick men and boats had to be dragged, he felt assured that they could not have carried with them more than forty days' provision, and presuming that they would make for the mouth of the Great Fish River, where Sir G. Back had described the fish as plentiful, they would arrive before the ice had melted. In Cambridge Bay, in 1853, fish were not caught until the second week in July; there is, therefore, every reason to suppose that the provisions being exhausted, the retreating party perished here.

With the object of his search so completely within his grasp, it was a source of regret that he did not succeed in attaining it. He has, however, the satisfaction to think that the laurel has fallen to the right crown, and that he who at an early stage of the search started on his sleigh, with the motto "*Persevere to the end*," had, after six winters of arduous toil, worthily won the prize. It had also afforded a still further exposition of that determined constancy, that high-souled perseverance which had animated Lady Franklin to continue

* *Ext.*—"I determined to run back a few miles (in a boat) to a safer harbour, where we could wait any favourable change in the wind and ice, and also if an opportunity offered make an attempt, by getting under the lee of Admiralty Island, to cross over to Sir James Ross's Point Franklin, only forty miles distant." There the document was found!

her efforts in spite of cold calculation and bitter sarcasm, until she had attained a successful issue—an issue that had cast its stamp upon the history of the world; and when Time had shed its halo over the deeds of this generation and it was told how the corner-stone to Columbus's great discovery was laid by the expedition under Sir John Franklin, it would also be remembered that, after the nation's treasure failed, the widow's mite prevailed.

A noble national picture is before us, one on which we have been occupied for three centuries and a half; it was begun by Sebastian Cabot in 1497 and completed, that is to say the water-boundary to the continent of America, was ascertained by Sir J. Franklin in 1847. Little by little had it arrived at its present state of perfection. On it was shown where Beechey, following up the discoveries of Cook, was joined by Simpson, who took up the course Franklin pursued to the westward of the Mackenzie.

On the opposite side Rae joined the explorations of Dease and Simpson to those of Ross. At the northern part of the picture was seen where M'Clure, by one long stride, joined Parry. The top of the frame to this picture may be said to have been found when the graves at Beechey Island were discovered by the expedition under Admiral Austin: the bottom was furnished by the relics brought home by Dr. Rae from the Isthmus of Boothia. You have heard this evening how the devotion of a wife provided Captain M'Clintock with the means of adding a side to it. This frame has been embellished by the sympathy, by the aid, which has been afforded to us by our brethren on the opposite side of the Atlantic; it has been gilded by the death of Bellot: one side is yet wanting before we can hang it up side by side with that of the achievements of our countrymen in the East, an assurance to after ages that it was the habit of Britons in this our time to follow up the fate of their fellow-countrymen, whether they were engaged in quelling rebellion in the burning clime of India or in the prosecution of science in the frozen regions of the Pole.

CAPTAIN SHERARD OSBORN, F.R.G.S., expressed a conviction that the search after the Franklin expedition was now closed and that it was perfectly useless to pursue it further, and he fully concurred in the logical conclusions arrived at by Captain M'Clintock in the paper just read. No one could feel the responsibility of such an assertion more deeply than himself; but having arrived at that conclusion it was only just to that gallant explorer, as well as to the influential meeting now present, that he should frankly state his opinion. Every one present, he was sure, would give Captain M'Clintock credit for not having *hastily* arrived at such a conclusion. Captain M'Clintock had been striving to unravel this problem during a long service of eleven years in the Arctic Regions and in four separate expeditions: such a man was not likely to say that all farther efforts were useless unless he conscientiously knew and believed it to be so. After perusing Captain M'Clintock's Journal, which had been written from day to day without any wish to arrive at any particular theory, and therefore on that ground eminently valuable, he was convinced that whatever track the missing men of the crews of the *Erebus* and *Terror* took, it was their last journey on earth, and that they must have perished between Cape Victory and the Hudson Bay Company's posts. It mattered little what track they pursued after leaving Beechey Island: it was enough to know that they reached the point where the ships were known to have been abandoned. After that they had the important fact that in twenty months the ships drifted only twelve or fourteen miles. He thought Captain Crozier only did what any other naval officer would have done under the circumstances, in abandoning his ships, for three long winters in that region was more than enough for any human being; yet the distance from Cape Victory, where those starving men landed, to the Hudson Bay Company's posts, was so great, nearly 1000 miles, that it was next to impossible that any of them could ever travel such a

distance; for although late Arctic expeditions had succeeded in traversing great distances, it should be borne in mind that in Franklin's time little if anything was known of modern sledge equipment. It is mainly to Captain M'Clintock that we are indebted for the perfection of our sledge parties in the present day. In 1848, when under Captain Sir James Ross, he was struck with the necessity and field for improvement, in the equipment of our sledges; and directly that the present Admiral, Horatio Austin, hoisted his pendant in the Arctic expedition of 1850, Captain M'Clintock called his attention to this fact, and I am bound to say that Admiral Austin gave M'Clintock "full scope and a fair field" for his suggestions; the consequence was a vast improvement, however, upon former sledge journeys: whereas in 1848 Ross, one of the greatest of our Arctic explorers, could only travel 200 miles out, in 1851 the parties under Austin accomplished 500 out and 500 back, or nearly 1000 miles. It was apparent that when Franklin's crews deserted the ships they had no fresh provisions, for at the cairn where the magnetic observations were made, discovered by Captain Hobson, not a single tin in which fresh meat or preserved meat would be kept was found, nothing but the bones of salt meat. He could easily understand then how these poor men perished in that sharp winter of 1847 and 1848 when, as it was recorded, nine officers and fifteen men died, a thing unheard of in Arctic expeditions.

COMMANDER HOBSON gave some account of the manner in which the records of the Franklin expedition, as detailed in his despatches, had been discovered. His opinion was that the bodies of the men discovered had perished in the endeavour to find their way back to the ship. The two in the boat were either boatkeepers, or men who having found it impossible to reach the ship had returned to the boat and died. He was convinced that there were none of that unfortunate expedition now living. It was a barren and inhospitable coast. There were few natives, widely scattered, and he thought it impossible for our seamen in the requisite time to have acquired the Esquimaux art of hunting. In a game country they might have trusted to their munition, but here there was no game for them to shoot. Captain M'Clintock stated that his party killed only 100 reindeer, 15 willow grouse, and a hare. During 74 days the party which accompanied him killed only 5 willow grouse and 1 bear. With such scanty resources then it was impossible for any body of men to have existed twelvemonths after abandoning their ships. If they had got as far as Montreal Island they must have arrived too soon, before the river had broken up. From the state of the ice at the mouth they could neither travel over it in sledges nor go through it in boats, and there they must have wasted their energies. He also believed that their supply of preserved meat failed them: it was supplied by Herr Goldner, whose name was too well known to the naval service to be easily forgotten.

MR. PARKER SNOW said he differed in some respects from the gallant officers who had preceded him. On behalf of the 105 men yet unaccounted for, he urged that the search should be renewed until some more positive information of their fate was obtained. These petty officers and men had wives and families as dear to them as the wives and families of the superior officers who had been mentioned. There was certainly no sufficient evidence that they had perished. It had long been his opinion that Sir John Franklin and his companions had either been forced out of their winter quarters at Beechey Island, or else had found a favourable opening to pursue the instructions laid before them to go to the south-west. They would then make instantly for Cape Walker, where he firmly believed that records of the party would yet be found, and would then come upon King William Land. With respect to their alleged fate, the meeting would be pleased to bear in mind that in the first part of the record deposited at Cape Victory it was stated "all is well," though it had been surmised that they had encountered many horrors and much

misfortune up to that date. He was prepared to go through the whole of the evidence to show that it was next to impossible that these 105 gallant spirits had perished in the way that had been suggested. Remember they were not helpless savages, but gallant Englishmen, who would not succumb while a chance remained. Such men as Captains Crozier, Fitzjames, Fairholme, Icemaster Read, Blanky, and others, were not at all likely to have died in the manner described. He could fancy such men before him now, struggling on amidst all difficulties, perhaps living and hoping for years, and often looking for assistance from that country for whose fame and glory they had gone forth. Viewing them as individuals—considering their especial character as picked officers and men—he could not and would not believe them to have all passed away until something more certain was known than the meagre information already obtained. He recommended another expedition overland to search the whole of the locality in the direction in which he supposed the survivors of the Franklin expedition to have gone. He reminded the meeting that one great object of that expedition was to make magnetic and scientific observations. He could not suppose they were so long in the neighbourhood of the Magnetic Pole without carrying on frequent observations which would, undoubtedly, be most valuable to science. He ventured to ask, had the Magnetic Pole been minutely searched for those signs and traces which might reasonably be supposed to exist there? At all events, until some record of the results was discovered, he would not abandon all hope. He was but a humble individual, without fortune and without name; but if his health was spared he would endeavour to go out next spring, whether alone or in company with others, and would explore the whole locality, and, if need be, ally himself to the Esquimaux until the riddle was solved.

MR. KENNEDY concurred with Mr. Snow. He had heard a rumour in the Red River colony that some time ago Europeans had been seen in the direction of the M'Kenzie River. He imagined these were some of the 105, and that there was a likelihood that some of them were yet alive. He did not fall in with the view that Britons could not live where Esquimaux existed. On the contrary, he believed Europeans could adapt themselves to native habits, for he remembered a volunteer in his expedition, named Hepburn, who accompanied Sir John Franklin in his first overland expedition, telling him that when they were put to the greatest straits he should have considered it a great privilege to have been allowed to settle down among the natives for life. Had he been permitted, he would have considered his chances of life greater by adopting their habits than by remaining with his party. Again, in Dr. Kane's narrative, they had instances of men desirous of passing the remainder of their days among the natives. The fur-traders of Hudson Bay underwent infinitely greater hardships than were undergone by Arctic explorers. Nothing less than another expedition would satisfy the public. He recalled attention to the difficulties which Lady Franklin had encountered in sending out the last expedition against opposition from all quarters, and after the results which that expedition had attained, it would be discreditable in the nation to let the matter drop where it was.

CAPTAIN M'CLINTOCK, in reply observed, that long experience proved that all the food the expedition could have carried with them was forty days' short provisions. The wonder therefore was how, being encumbered with large boats, they got so far, and there was no possibility (the provisions being exhausted) that they could have made their way from the mouth of the Back River, or Montreal Island, to any inhabited part of the Hudson Bay territory. Any gentleman with chart and compasses might assure himself of this fact. Mr. Kennedy was mistaken in supposing that the natives, among whom John Hepburn would gladly have sought refuge, were *Esquimaux*—they were *North-American Indians*, inhabiting a wooded country abounding with fish and game: and

although the lamented Dr. Kane has told us how gladly he would have taken refuge amongst the Esquimaux to escape starvation and disease on board, yet we know that those who did actually desert their ship, could not find refuge or the means of subsistence amongst the Esquimaux, and were compelled to return, as their only hope, to the vessel they had so confidently left three months before. He had no wish to throw cold water upon the hopes of any enthusiastic persons who might wish to go out to *re-search* that locality. He would remind the meeting that all the way from the mouth of the Back River to the Hudson Bay territory had been searched in 1855 by Messrs. Anderson and Stewart, and, therefore, the entire route intended to be pursued by the lost crews had now been explored.

DR. R. KING observed that it must be remembered the search made by Captain M'Clintock had been made in the cold season, when the land was covered with ice and snow, but that more traces—even the journals or the log-books—might possibly be discovered by a search during summer.

SIR R. MURCHISON, in adjourning the meeting, said it was a great fact, in the truth of which all those seamen who had taken part in the discussion, whether belonging to Her Majesty's service or to the mercantile marine, agreed, that, whilst Sir Robert M'Clure had been worthily rewarded for his intrepid conduct in making a north-west passage, Franklin was the man who, by the self sacrifice of himself and his brave companions, had previously, by common consent, made the north-west passage.

Second Meeting, Monday, November 28th, 1859.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*The Hon. Robert Marsham, William Fryer, and George Lee, Esqrs., were presented on their election.*

ELECTIONS.—*Captain H. H. Godwin Austen; Captain the Hon. Arthur A. Cochrane, R.N.; Lieut.-Colonel C. Lygon Cocks; Major W. E. Hay; Captain A. Cooper Key, R.N.; the Earl of Lichfield; Colonel W. Pinney, M.P.; Sir Erskine Perry; the Rev. Frederick Silver, M.A.; Captain Charles Sim, R.E.; Captain William Strutt; Lieut.-General Sir Charles Yorke, K.C.B.; Robert E. Alison; P. Watson Braybrooke; Richard Cull; G. Wingfield Digby; R. H. Wallace Dunlop; John P. Gassiot, jun.; Isidor Gerstenberg; H. Hucks Gibbs; H. Harwood Harwood; Chandos Wren Hoskyns; Louis Levinsohn; John C. M'Grath; Thomas Maclear, Astronomer at the Cape; George M'Leay; G. Sholto Douglas Pennant; William Perry; Charles Phillimore; William H. Purdon, C.E.; E. G. Ravenstein; Edward H. Richards; Christopher Sykes; J. M. Tronson, M.D., R.N.; and William Westgarth, Esqrs., were elected Fellows.*

ANNOUNCEMENTS.—The Chairman announced that he had that day received, from the Duke of Newcastle, a notification of the safe arrival of the British North American Expedition under Captain Palliser, at Fort Colville.

EXHIBITIONS.—Sketches in Burmah, Punjab, Himalayas, and Kashmir, by Captain H. H. Godwin Austen, F.R.G.S.; Sketches of the Scenery, &c., on the Zambesi, by Thomas Baines, Esq., F.R.G.S.; Photographs of Ancient Hindoo Temples, by W. H. Purdon, Esq., F.R.G.S.; Sonnenstern's Map of Central America, &c., were exhibited.

The Papers read were:—

1. *Sun Signals for the Use of Travellers (Hand Heliostat)*. By FRANCIS GALTON, Esq., F.R.G.S.

A PAPER was read by Mr. Galton in 1858 before the British Association on the principle, explained by a rough wooden model, of the instrument which is the subject of his present communication, but which, in the interim, has been considerably modified and improved. Many matters connected with its use and application have been more thoroughly worked out. The following is an abstract of that part of the paper which bears more immediately on the construction of the hand heliostat. Instruments made for the author by Messrs. Troughton and Simms, were laid on the table.

The principle of the instrument may be shortly recapitulated as follows:—The fact is a well known one, that if a looking glass be held in such a manner that a distant observer can see a portion of the sun's disc reflected in it, it assumes the appearance of a brilliant star, and can be seen at extraordinary distances. Many endeavours have been made, with various success, to utilise this remarkable power for the purpose of telegraphs,—the signals being distinguished by different combinations of flashes,—but no instrument has hitherto been contrived that admits of being carried on the person, held in the hand, and used at will. From experiments detailed by the author, it appears that a mirror whose rays are obstructed by a screen having an aperture of only $\frac{1}{4}$ of an inch in the side, is visible to the naked eye at a distance of ten miles, *if the background be dull and the air perfectly clear*. In other words, a mirror is visible, under those circumstances, if its effective area is a square whose sides subtend one tenth of a second of a degree in angular measurement. But, in practice, some allowance has usually to be made for the opacity of the air traversed by the rays, and a simple formula helps us to collate experiments, made under different circumstances of distance and fine weather. It is necessary in each particular case to make the best estimate possible of the extreme distance which any reflected solar rays could possibly traverse; call this d (the distance at which high lands cease to be visible at the time of experiment gives a good clue towards estimating d). Let x , less than d , be the distance of the signaller. Then, on a perfectly

clear day, the side of the effective area of the mirror must subtend

$$x \cdot \sin. \frac{1''}{10}; \text{ but, on a hazy one, } x \cdot \sin. \frac{1''}{10} \cdot \sqrt{\frac{d}{d-x}}$$

In most cases, a still further increase of size becomes necessary, because the landscape that forms a background to the station of the signaller, when seen through a mass of luminous haze, ceases to be of its natural dull colour, and may assume an appearance, nearly as bright as that of the sky itself.

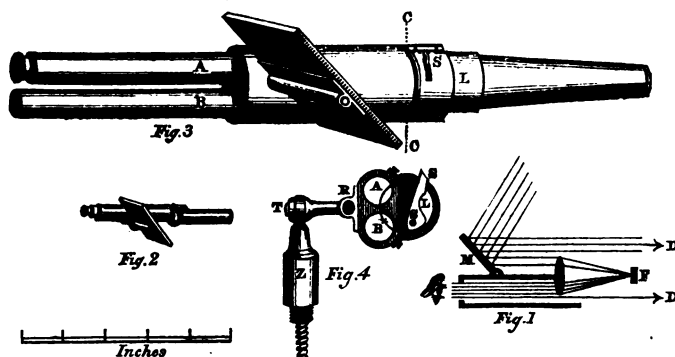
The degree of brilliancy of the sun above head, has not much influence on the visibility of the flash—for the brighter the day, the more luminous the landscape, and the contrast between the flash and the surrounding tints is but little affected.

It follows from all this,—though we have no space in this abstract to enter into the details,—that a mirror of a few square inches in size, even though considerably inclined, is amply sufficient not only to be seen for distances far exceeding those ever used in ordinary telegraphy, but, also, to attract attention through the brilliancy of its flashes, whenever the high land, distant ship, &c., where the signaller may be standing, is itself, even dimly, visible.

The difficulty is to direct the flash aright, for, as the rays of the sun are reflected from a mirror in a cone precisely similar to that which reaches it, the mirror itself (whose size may be disregarded) being the apex of the cone and the sun's disc its base, it follows that, to the signaller, whose eye is near the mirror, the place where the cone of reflected rays falls on the distant landscape would always appear to him as a disc of simply the same shape and size as the sun itself. In the author's heliostat, an image of the sun is produced, which precisely overlays the area on which the flash of the mirror falls. It is contrived on the following principle. Fig. 1 is a tube with a lens across one of its ends to whose true solar focus a screen of white paper, *F*, is adjusted; a mirror, *M*, turns on an axle attached to the tube, which allows it movement in one direction, while the rotation of the entire instrument in the hand gives movement in the other. When the mirror is so adjusted that the reflected (parallel) rays from any one point of the sun's disc impinge on the lens, they are brought by its means to a focus on the screen, and form a minute speck of light. Rays radiate from this in all directions, and those that strike the lower end of the lens are reduced, by its means, back again to parallelism with the rays that originally left the mirror. Consequently an eye, looking down the tube, sees a bright speck of light on the lens, which it refers to the *same* distant point, *D*, in the landscape seen to the side

of it, as that to which the unobstructed rays from the mirror are being flashed. If a telescope be used, the white spot actually appears to overlay the distant point. Now what is true for any one point in the sun's disc is true for every point: therefore the signaller sees a luminous disc, and not a mere point, in the field of view of the instrument, and this exactly overlays the *locus* of the flash. By gently rotating the hand, the image can be made to cover or to forsake any given object that may be desired, and, when that is done, the rays of the mirror will produce an appearance of flashes, as seen from that object.

Very small instruments, of great efficiency, can be made as in Fig. 2. Their tubes should pull out to not less than 4 inches, or it will be difficult to make signals when the sun is low and behind the back, on account of the shadow of the head.



A much more perfect instrument is shown in Fig. 3. (Fig. 4 is a section of Fig. 3 through *cc*.) The lower tube *B* is a plain tube, and simply used as a "finder;" the upper tube, *A*, is a theodolite telescope, and affords means of signalling with the utmost precision. When the sun's image covers the distant ~~position~~ *position* at the time that the latter is seen at *x* in the plain tube, then, on looking through the telescope above it, the sun's image will be found to overlay the object, whenever the latter is brought into the field of view. The adjustment, by which this result is ensured, is by drilling the eye hole of the plain tube so that a line passing through it and through *x* shall be parallel to the axis of the telescope. By pushing the slide, *s*, backwards or forwards, the quantity of light that can reach the lens is regulated at will, and the image of the sun can be toned down to any required shade. A little practice with the instrument makes it exceedingly easy to bring the image of the sun on to the field of view in the first instance. It is done by grasping

the instrument with the left hand across its middle in such a way as to leave a finger and thumb free to move the mirror. Next, holding the right hand, as a screen, against the end of the instrument, the latter is raised nearly to the eye and directed as justly as possible towards the object aimed at. Then, rotating the whole instrument with the hand and moving the mirror backwards and forwards with the fingers, the flash is watched, until it is seen to fall upon the palm of the right hand. Finally, the instrument is rotated carefully, and the mirror gently moved, until the flash falls as full and fairly on the hand as it is possible to direct it: when this is the case, on raising the tube to the eye, the image of the sun is almost sure to be caught on its field. The instrument is fully as easy to work with as a sextant. Without stirring the mirror, there is power of flashing to any desired point within a large area, by slightly rotating the instrument and following the image; also by making contact in different parts of the field of view. Rapid, passing flashes are barely visible, for the mirror must be held steadily during an appreciable time in order to be seen to full advantage.

The heliostat can be mounted on a rest, which may screw at will, either into any piece of wood or into the top of a photograph tripod stand, as shown in Fig. 4. For long continued signalling, a stand is undoubtedly convenient. *x* gives ample rotatory movement; *y* allows a sufficient movement in altitude, and *z* complete movement in azimuth. No counterpoises are needed for an instrument of ordinary size. The looking glass used for the mirror must have its sides truly parallel. It may have a narrow rim of silvering removed all the way from round its edge, and be cemented on to the top of a shallow glass tray. In this way the silvering is hermetically sealed from danger; and if the common *diamond cement* be employed, no heat or ill usage can separate them.

The instrument may be used simply to attract attention at great distances or to convey a few simple signals, as single flashes for affirmation, doublets for negation, and so forth: for this purpose the small instrument Fig. 2 would fully suffice, or letters and words can be signalled by adopting the well-known notation of Morse's electric telegraph. It is necessary, before beginning, to have some vague general idea where the intended correspondent is situated, then to sweep the distant landscape with the flash, and await his answer. As soon as this has been made, communication can be carried on as long as may be desired. A long line of horizon can be swept, backwards and forwards, with perfect ease, and it is found to be just as easy to attract the attention of a correspondent, whose position is unknown, to 5 or 10 degrees, as when it has been ascer-

tained with perfect accuracy. Where a considerable depth, as well as breadth, of landscape has to be searched, the operation is more tedious. The landscape must be swept in closely parallel bands.

This instrument is of course useless without sunshine, and is intended chiefly for those lands and seasons where sunshine is the rule and not the exception. It is believed that it would be of constant service to a traveller in them. It requires no sky line, as all other signals do, to bring it out into relief, but can be used from any spot where the sun's rays reach it. It works in perfect secrecy to all except those near the line of flash. Its power is enormous as regards the distances across which it can communicate; and lastly, its portability is extreme. Fig. 2 can literally be carried in the waistcoat pocket, and can make a signal visible to the naked eye, under very adverse circumstances of haze and position of the sun, at a distance of 5 or 10 miles. Instruments such as Fig. 3 would probably be of great service to two or three travellers engaged in triangulating a country, or to land parties communicating with a ship.

SIR R. I. MURCHISON said they were much indebted to Mr. Galton for calling the attention of the Society to this subject. Doubtless many of those who were then assembled may be more gratified by descriptions of foreign travel; but the Society could not be too thankful to those who, from time to time, refer back to the elements of the science and bring to its notice the consideration of instruments of real value to the explorer.

SIR EDWARD BELCHER, F.R.G.S., regretted that General Portlock or Colonel James were not present to speak more decidedly on the use of the heliostadt during the Trigonometrical Survey of Great Britain. But in the year 1835, when he was engaged in the connection of the two surveys of Great Britain and Ireland, for the object of completing the Hydrographic Survey of the Irish Seas, he was informed, as the documents also witnessed, that one shot was obtained from Slieve Donard, in Ireland, to Scawfell, in Cumberland, and *vice versa*, a distance exceeding 108 miles, and that it was effected by heliostadts, requiring fourteen days' close watching at each station where the parties were encamped.

In the year 1833 a complete set of instruments were supplied to him in order to connect the vessel stationed, and moored in position, on the Skerki Reef, with the positions on shore, at Zembra at the mouth of the Bay of Tunis, and Maritimo on the coast of Sicily; but owing to the motion of the vessel, as well, probably, to defect in directing the flash truly, from the height to an object not visible, it did not prove successful.

He considered under such circumstances—that is, seeking for a flash at very great distances beyond the limit of common vision, unless the calculations of the two positions approximated *very closely* to the truth—that great difficulty would be experienced, and unless the reflecting plates were very perfect and truly fixed with relation to the directing telescopes, success could not be hoped for at such great distances.

He had himself witnessed the effects of the heliostadt used in connection with the survey of the country surrounding St. Paul's, and in particular one distant 40 miles: as seen from the station above the cross of St. Paul's, the object was intensely luminous, too much so to be observed with the precision required, as it occupied the whole system of wires.

In the case of the Irish and English survey, as he before remarked, they were fourteen days intensely occupied in obtaining simultaneous observations, and he believed it resulted only from their very perfect calculations that they were enabled so truly to direct their telescopes and eventually succeed.

MR. T. MACLEAB, F.R.G.S., Astronomer Royal at the Cape, was convinced from experiments which had been made at the Cape of Good Hope, that with a five or six inch screen, from 120 to 200 miles a glass might be seen as a star of the fourth or fifth magnitude, through a small telescope. They had very successfully employed signals at a distance of 25 miles.

MR. GALTON remarked, in answer to Sir E. Belcher, that the difficulty of aim was altogether independent of the distance, and that, with his own hand-instrument, the horizon could be swept, and a correspondent sought out, with the utmost facility, as he himself had continual occasion of experiencing. But, on the other hand, without some optical contrivance for knowing accurately where the flash was being sent, it was extremely improbable that the small cone of rays which proceeded from the mirror should be thrown in the desired direction, and still more so, that it should be made to cover the distant station for a sufficient length of time to be properly visible.

The second Paper read was :—

2. *Latest Accounts from Dr. LIVINGSTONE, F.R.G.S., of the Central African Expedition.*

THE numerous papers received from Dr. Livingstone refer to two main points : the one the navigability of the Zambesi, and the other the capabilities of the valley of its affluent, the Shiré, and those of the Shirwa lake, which adjoins it.

The Zambesi has been examined five times over from between Tete to the sea, and Dr. Livingstone's conclusion is, *firstly*, that a navigable entrance has been determined by Captain Berkeley, of H.M.S. *Lynx*, up the Luabo, and by himself up the Kongone. *Secondly*, that a large vessel could be taken up to Tete at any time between January and April. (This is the unhealthy time of the year ; but the Zambesi fever has hitherto appeared a far less formidable illness than was feared.) *Thirdly*, that in a season of unusual drought there were found to be only three crossings, from one deep channel to another, over which his little steamer had to be dragged. These were from 24 to 18 inches deep, and from 100 to 150 feet long. The force of the current of the river averages $2\frac{1}{2}$ knots, but never exceeds 4 ; and Dr. Livingstone considers that a vessel, literally drawing no more than $1\frac{1}{2}$ feet water, could ply at all seasons for the first 300 miles of the Zambesi.

Above Tete the case is different. The long rapids of Kebra-brasa commence 30 miles from that town. They were visited by Dr. Livingstone when the river was still at its lowest, and he describes the appearance of the first part of them as follows :—The river was

confined to a channel of only 30 to 60 yards wide, with perpendicular and water-worn sides of from 50 to 80 feet high. This narrow channel wound, from side to side, through a dry upper bed of about a quarter of a mile broad, that was strewn with huge blocks and boulders in the wildest confusion, and was overflowed by the river at the time when it was high. Even in this narrow channel the river rarely ran more than 4 knots an hour: that speed was, however, too much for Dr. Livingstone's steamer (of which he bitterly complains). He therefore left her behind, and continued his examination on foot. The journey was exceedingly toilsome. The worst cataract seen, was one where the fall appeared to be 30 feet, and where the river was confined between precipices of 500 or 600 feet high.

A second expedition was made to these rapids in January, under the command of Mr. C. Livingstone and Mr. Baines, at a time when the Zambesi was nearly at its highest. The party started in a boat and went as far up the rapids by paddling and by tracking as it was possible to venture: they then continued their exploration on foot. The face of the river had become greatly altered; but the minute report of Mr. Baines appears to hold out little hope of its navigability under any circumstances. He speaks of one rapid with a fall of 3 feet 9 inches, and of eddies along which no vessel larger than a boat could venture with safety, lest her head and stern should be caught by the opposing currents. At one place the river was in part taken up by "upheavings of the water 4 feet or more in height, rising and falling in most undescribable confusion," and elsewhere by eddies and a shallow flat covered with sharp stones. The great fall seen by Dr. Livingstone was still there, but did not appear so formidable. Mr. Baines has made drawings of the rapids, which are to be seen in the Society's rooms. Mr. C. Livingstone's opinion, and Dr. Livingstone's conclusions, appear more favourable than those of Mr. Baines.

Shirwa Expedition.—At the time that Messrs. C. Livingstone and Baines were examining the Kebra-brasa rapids, Dr. Livingstone and Mr. Kirk explored the Shiré in the steamer. They were obliged to leave her in lat. $16^{\circ} 2'$, long. $35^{\circ} E.$, whence, travelling on foot—at first alongside the river and then leaving it and going to the N.E.—they reached a lake of large size, hitherto unknown to Europeans, and called the Shirwa. The steamer was ultimately taken up an affluent of the Shiré to within 30 miles of the lake. The lake has no outlet: its waters are bitter, but drinkable. It is 2000 feet above the sea, 25 to 30 miles broad, and 60 to 70 miles long, in addition to a narrow southern prolongation of 15 miles more, and it is stated to be separated from Lake Nyanja, on the north, by a strip of land of no more

than 6 miles wide. A hill of 6000 feet separates the valleys of the Shiré and the Shirwa. There are other hills besides: nearly all of them are thickly covered with grass and trees, and are very beautiful. The paths in the valley are but a foot wide, and lie through dense grass 6 or 8 feet high. A few yards often hide a companion completely, and guides are absolutely necessary. The soil of the entire country is rich and well cultivated in patches. Cotton is largely grown: everybody spins and weaves it. Two parties of Ajana slave-traders were on the Shirwa at the same time as Dr. Livingstone: they were in the habit of carrying their captives to Quillimane. Dr. Kirk's report closes as follows:—"We have thus shown a navigable river to exist upwards of 100 miles in length, a people engaged extensively in agriculture, with a soil capable of growing not only cereals but also cotton and sugar-cane of excellent quality, and in almost unlimited amount. This rich valley may be divided into three portions: the *first* near the Zambesi, about 20 miles in length, cultivable; the *second* only 15 miles, marshy, but abounding in game; the *third* 25 miles: this is probably both the richest and healthiest of the three. The general width may be estimated at 20 miles. The situation of Morumbala, at the junction with the Zambesi, would be of the greatest importance to Europeans as a healthy station midway between the growing districts and the sea. While in the river none of our party complained of the least sickness, although we were much exposed, and this is the unhealthy season." Dr. Livingstone expresses an earnest hope that a more efficient steamer may be sent to him, even though it be purchased out of his own funds. He replies with warmth to the objections of those who do not credit the future commercial value of the countries bordering the Zambesi, and he points out the advantages which would attend a colonization of their healthy highlands by a British community.

Mr. T. MACLEAR, F.R.G.S., observed that Dr. Livingstone had forwarded to him—one of the essentials in discovery—a very considerable amount of astronomical observations for latitude and local time, also five observed occultations, by which the longitudes of the places discovered had been determined with great accuracy, and free from instrumental error.

The CHAIRMAN said that perhaps Mr. Crawford would defend his own opinions on this subject.

Mr. JOHN CRAWFORD, F.R.G.S., said it was possible he might be the individual alluded to by Dr. Livingstone, and would certainly desire to have the opportunity of saying a word or two in his own defence; but at the same time he was determined not to say a syllable that might be considered disrespectful to that most enterprising traveller. Dr. Livingstone did not say that he was either a merchant or an agriculturist; and he (Mr. Crawford) had a perfect right to dispute the opinions advanced by him on those subjects. First, then, as to the Zambesi. He still held by the conviction that the Zambesi is not a navigable river. Take Dr. Livingstone's own description of the river, and he

would then ask for what sort of vessels is it navigable? During the time the river was at its highest, which was from November to March—the South African summer—the places on its banks were so unhealthy that they could not be passed without great risk; so that, at the most, for one half of the year the river was not navigable. With two and three feet water only in its upper course, what sort of a navigable river was that? The Zambesi could not be made available for commercial purposes in the English sense of the term. The next point respected the growth of wheat. Now, what he (Mr. Crawford) really had said on a former occasion was, that the natural country for the growth of wheat was not within the tropics—that nearer than 25° or 26° latitude wheat could not be grown to advantage. He did not say it might not be grown within the tropics at a high elevation—even upon the very equator itself. Dr. Livingstone saw a few patches of wheat growing on the mud-banks of the Zambesi in 16° of latitude, but at what elevation he does not state: that circumstance, however, did not prove that wheat was the proper grain to grow in that country. Rice had been grown in this country—a capital crop was obtained some years ago near Windsor—but it did not follow that rice was the proper crop to be grown in Britain. Now a word about indigo. He (Mr. Crawford) complained of the African indigo for its being too short, and not for its being too long. Dr. Livingstone was totally mistaken about that matter. As to cotton, he would say in plain terms, you will never get good cotton from the savages of Africa. It is impossible that such a people should produce cotton fit for the manufactures of this country. The Hindoos were a highly civilised people in comparison with Dr. Livingstone's negroes; but, if we were to depend upon the people of Hindostan, nine-tenths of the greatest manufacture of this country would perish at once; and if we were to depend on African cotton, we should speedily be in a worse condition than we were two hundred years ago. Dr. Livingstone had broached the subject of African colonisation, and thought a region in the 16th degree of latitude a proper locality for Scotchmen to plant themselves in. He (Mr. Crawford) was not the Scotchman to go there himself, and he strongly advised Dr. Livingstone's twenty Scotch families, with their highly respectable pastor, to let it alone. According to Dr. Livingstone, they might get a hundred square miles of land for a song, but they might just as well get a hundred square miles of cloud above their heads, for all the good such land would do them.

MR. LYONS M'LEOD, F.R.G.S., said, from his experience of the Niger expedition he was convinced that the proper time for ascending the rivers of Africa was during the rainy season. The Zambesi should not be ascended later in the year than March; and at that time he had not the slightest doubt that a vessel drawing eight feet of water could not only reach Tete, but anchor at Zumbo, and have the whole of the interior of Africa at command. Some months ago he had stated in that room that wheat was grown at Tete, and his statement had now been confirmed by Dr. Livingstone. He had also said that sugar was grown—that the natives were not only acquainted with the sugar-cane, but actually made sugar, not very good, indeed, because the process of manufacture was but ill-understood. He had remarked that an abundance of cotton was to be found all over Eastern Africa. And not only so, but he had brought specimens of the cotton home. The commonest of all, which was not thought to be fit for the manufactures of this country, was spun into stockings by the ladies of Liberia, so that what we despise is valuable there. He had brought home specimens of timber; it was said that the wood was not adapted for any purpose whatever, and certainly not for ship-building; however, at the instance of the Admiralty, these specimens were sent down to Woolwich. A vessel, moreover, of 500 tons burden, built of Seychelles timber, had been submitted by the owners to the Admiralty, to be pulled to pieces if desired; and specimens of the timber of that vessel might now be seen in Somerset House,

and should be seen by those who think that East Africa does not produce timber. The Lords of the Admiralty were convinced to the contrary, and they had given him a commission to assist in obtaining timber from the east coast to rebuild our navy. Along the whole of the east-coast rivers immense forests of timber were to be found, and much of the wood was admirably adapted for ship-building purposes. To return to the question of the navigability of the Zambesi. If they went up in the rainy season, when the deltas were covered with water—and a steamer could then go right through that belt of death before the malaria could affect those on board of her—he saw no reason whatever why they could not reach Tete from Quillimane in five or six days' time. It had been imagined that there was only one mouth to the Zambesi, but the Portuguese had known of the other mouths, through which Dr. Livingstone went, for thirty years, and by means of that knowledge they had been enabled to escape with their cargoes of slaves from the English cruisers. They had led the commanders of the cruisers to suppose that they would obtain a prize at the Quillimane mouth of the river, and, while they were watching there, the slave-ships escaped by the other outlets. Now that Dr. Livingstone had discovered their secret, the Portuguese had established custom-houses at the Loando mouths of the river for the purpose of preventing English commerce. The question therefore arose, are we to open the interior of Africa for the benefit of the Portuguese? The sooner the question was settled, the better for the commerce of this country and the interests of the people of Africa. What we were doing now in the interior of Africa was simply for the benefit of the Portuguese, and this state of things must not be allowed to continue.

CAPTAIN BEDINGFELD, R.N., F.R.G.S., said,—that it was with feelings of considerable mortification that after a voyage of 10,000 miles and back he was unable to give as much information as he could have wished upon a subject of such interest to the Society. It was, however, well known that, owing to misunderstanding between Dr. Livingstone and himself, he was sent home soon after he arrived in the Zambesi.

He was aware that that was not the time or place to enter into particulars as to the cause of his leaving the expedition, and that were he to do so it might appear like putting a man on his defence during his absence, which he did not wish to do, but asked the indulgence of the Meeting while he endeavoured to show that he did not desert the expedition when in difficulty, or as Dr. Livingstone expressed it in his published letters, "when he thought they could not move hand or foot without him."

The CHAIRMAN said,—he was sure that all present entertained the greatest respect for Captain Bedingfeld's former services on the western coast of Africa, whilst they must have regretted that any misunderstanding should have occurred between Dr. Livingstone and himself. This, however, was not the proper time and place for any explanation, because Dr. Livingstone had not preferred a word of complaint against Captain Bedingfeld in any Memoir read before the Royal Geographical Society. It was therefore to be hoped that the gallant officer would not proceed further in his personal explanation, but confine his remarks to points purely geographical.

CAPTAIN BEDINGFELD.—So long a time had elapsed since his return that the earlier events would have lost much of their interest; without therefore entering into detail he would endeavour to mention such as are connected in some way with the navigability of the river.

The expedition arrived off the river on the 14th May, 1858, but, owing to a gale of wind from the south-east, did not get into the "Luawe," or West Luabo, until the following day. They were directed to examine this river in the first instance, as it was then supposed to communicate with the Zambesi, and to have a better bar than the other mouths.

On the 16th the steam-launch was hoisted out, and having been put

together they commenced its exploration to (what he believed to be) its source without finding any communication with the Zambesi. It was then decided that Mr. Skead, the Admiralty Surveyor, should leave in the *Pearl* and endeavour to find an entrance into Parker's Luabo (or Kattrina) mouth, as it is called by the Portuguese, and on the 30th, in company with Her Majesty's Ship *Hermes*, she steamed to the eastward, and he was left in charge of the steam-launch.

On the 3rd of June the *Hermes* returned off the bar and made signals to him to come out to her; this was not easy for a vessel 75 feet long, and whose gunwale was only 18 inches from the water, and it was a pretty severe trial of how her sections were put together; they got out safely, however, and having been taken in tow by the *Hermes*, off the bar of the "Kongone" (where the *Pearl*, having found a channel, was at anchor inside the bar), waited for high-water to make a push in. It had been arranged by Captain Gordon that upon their arrival the master of the *Pearl* should send down one of his (Captain Bedingfeld's) whaleboats inside the bar to point out the channel to him; but although the *Hermes* fired several guns this was not attended to, and as he was obliged to get in at high-water, Captain Gordon endeavoured to point out the way; unfortunately, and partly owing to the sun shining full in his face, he made a mistake, and after he (Captain Bedingfeld) was well in amongst the breakers, he found he had to haul up to clear a sand-bank or go on shore; this was a dangerous business, but the little launch behaved nobly, and with the exception of being half swamped, they got in without accident.

Having sounded the bar of the "Musélo," or "Tinbue" (the Kattrina had been previously sounded by Mr. Skead) and examined the river ahead, it was decided to take the *Pearl* through the narrow creek, 20 yards wide and about $4\frac{1}{2}$ miles long, connecting the Kongone with the Zambesi, in lat. $18^{\circ} 41' \text{ s.}$, long. $36^{\circ} 3' \text{ E.}$; this was done with some difficulty, and having ascended about 9 miles from this entrance, the *Pearl* was finally brought up by shoal-water on the 13th of June, 20 miles from the mouth of the river.

After a consultation it was now decided that an island should be selected upon which to land their stores in order that the *Pearl* might at once proceed on her voyage to Ceylon. The island thus selected was about 20 miles farther up, called Nyeka (or by them Expedition Island). On the 16th he commenced to take the stores out of the *Pearl*, and by the 26th, iron-house, sugar-mill, saw-mill, spare engine, numerous stores, including 6 tons of coal, in all at the lowest estimate 40 tons, had been towed up by the steam-launch a distance of 20 miles, against a current averaging $2\frac{1}{2}$ knots an hour; they had occasionally a heavy pinnace, carrying 6 tons, and a cutter with about 2 tons in tow at the same time, and with a small quantity on board she would keep up a speed of $4\frac{1}{2}$ miles an hour.

The *Pearl* was dismissed on the 26th June, and Captain Gordon of the *Hermes*, his surgeon Dr. Ord, Mr. Skead, and 20 men left in her. To Captain Gordon they were indebted for every assistance in his power, both in men and boats, and he finally left his pinnace, fully rigged, with them; without her they never could have got up all their stores.

From this date to the 31st July he was fully employed in exploring and towing up goods as far as Senna, and in making a rough chart of the river; this latter was not easy, as he had at the same time to watch the ripple closely to avoid running aground, to teach his kroomen to take the helm and lead, and also to get an occasional help with the sails.

From where the *Pearl* anchored, almost the whole way to Senna, the river is one labyrinth of islands, shoals, and ledges, the current even at that time of the year (June) running 4 or 5 miles an hour; they frequently could not find even 3 feet of water, and had to return for miles to grope out a channel, the river in some places being between 2 and 3 miles wide. At Senna itself there

was no approach that year within a mile,* the river having deepened on the opposite shore, and from the constant shifting of banks and even whole islands it is difficult to lay down soundings at all correctly; had, however, his rough chart been sent home (which was taken from him by Dr. Livingstone together with his instruments), it would have given some idea of the depth of water at that time. He might add, that owing to the changeable nature of the river, the Portuguese have almost entirely given up the use of launches, as they find the canoes swifter and better.

The river sometimes overflows its banks, but not often; the last time it did so was in 1839; at that time the course of the Mutu could not be distinguished, and canoes came direct overland from the Zambesi to Quillimane. At the end of June 1858 the bed of the Mutu was about 8 feet above the level of the Zambesi, with long grass growing in it: the water abreast of it was about 2½ feet, but there was a deeper channel on the opposite side of the river.

With regard to the entrance of the Zambesi, the only bars worth surveying would be the "Kattrina" and "Kongone;" the former if properly surveyed would prove to be the best, as it was the direct discharge to the largest body of water, and after passing the bar an advance of 10 miles clears the mangrove; you then come to high grassy banks that extend all the way to Mazarro of the Mutu. It should be remarked that from the mangrove to Shupanga, a distance of 70 miles, there is no wood fit for steaming purposes.

The Kongone has the objection of the narrow creek with two awkward elbows, and as many banks; the average depth at high water is 11 feet.

The Musélo has too wide a mouth, and is too much exposed to the south-east ever to be of much use. On a smooth day when they sounded it they had to turn back for the breakers in 10 feet.

Mr. Cooke, the master of the *Lynx*, has made the best plan of the entrance, but it is evident, if ever the river is opened for trade, much more time must be spent on the survey than any of them had at their disposal, and regular pilots would have to watch the constant changes.

The Quillimane bar has 3½ fathoms at high water spring-tides, but the communication with the Zambesi is cut off several months of the year. The creek near the entrance connecting it with the other mouths is a mere ditch, dry at low water.

The climate in June was delightful, with the exception of thick fogs in the morning; the thermometer at night was frequently down to 50° Fahr. The two or three cases of fever they had were, in his opinion, mainly caused by exposure to the fogs and heavy dews, against the advice of Dr. Kirk: such exposure in any river on the West Coast would have laid the whole party up in a fortnight. Mr. Baines was several times knocked down in this way,* and from overwork in the midday sun his head was very much affected, and he was obliged to be watched in his tent.

The country from Mazarro to Senna is exceedingly rich and in some places a good deal cultivated; at one garden he counted sixteen different productions, including cotton, tobacco, sugar, Indian corn, and several European vegetables; there is also fair wheat and excellent rice grown nearer the coast. Shupanga appeared to him to be the place for agricultural enterprise; a Portuguese farmer told him it was admirably adapted for cotton or sugar, but nobody would plant because it was quite uncertain who gets the crop, the natives or the owners. They all have to pay black mail to the Landeens, a Senhor Cruz, who pays 400 dollars to the government for his house, and in addition 500 dollars to the Landeens for permission to live there and make canoes; the government is not strong enough to protect them.

Whilst at Shupanga Captain Bedingfeld walked with Dr. Kirk and Mr. Thornton to some lakes about 20 miles to the north-west; the principal one was called "Bovie," and was, he should think, about 5 miles long and

3 miles wide; it abounds with hippopotami, but the water is not good to drink. The country is very fertile; during their march six Zulahs joined them from a party of about forty near Shupanga: these people came up this way after they were dispersed under Dingaana, at Natal, by the emigrant farmers. Upon their arriving at the village where they intended to pass the night, they found great difficulty in procuring food, the natives asking enormous prices, whereupon their Zulah chief came to their assistance, explaining that they were not Portuguese but Englishmen, liberators of the blacks, and that they could walk like men and had not to be carried; he had also heard of the white man living with Moselekatse: in the end they were supplied with everything they wanted, and were treated most hospitably without payment.

On their return they took a round through an immense forest that Dr. Kirk might get samples of the sandal wood and buaze; in addition to these trees they saw ebony and *lignumvitæ*. Dr. Kirk also found six different kinds of Indiarubber. It was remarked to him by a Portuguese, that "he could not understand our going 600 miles up the country to grow cotton that would never pay to be brought down to the coast when there was such a place as Shupanga so much nearer, healthy, the river navigable, and abundance of wood for use or exportation." The size of some of the trees near must be very large, as he measured one canoe 35 feet long, 4 feet deep, and 4 feet wide, of a kind of mahogany.

When he was at Quillimane the trade was almost dead; this was partly caused by the wars, but more, he was told by an American merchant, by the restrictions and difficulties thrown in the way of trade by the government. He had been obliged to take money for his goods, as there was little or nothing for barter. He had collected a small quantity of ivory, Indiarubber, and columba-root; the latter said to grow in abundance, but owing to the dry season burning up the leaves, the natives could readily discover the root; this gentleman had asked to go up to Tete to trade, but it was not allowed.

In conclusion he would now add his testimony to that of numerous English officers, to the ready assistance, great hospitality, and kind attention of the Portuguese generally; but he would especially mention Colonel Nunes, at whose house he was entertained for two months. The Colonel has been in the country thirty-five years, and is always ready with any information in his power. He was bound to say that his description of the rapids proved to be most correct: he also mentioned the lakes to the north of the Morumbala; he described them as a chain of lakes from which the Shiré took its rise, and also another river that he understood him to run to the eastward of the mountains. During his stay at Quillimane a caravan of "Mujoás," from the Lakes, paid their annual visit, and brought with them for sale iron hoes, ivory, and a few slaves. The women had the peculiar bone thrust through the upper lip, mentioned by Dr. Livingstone, making them look perfectly hideous. So little demand was there for slaves at that time that an able-bodied man was offered at 6 fathoms of cloth, valued at $1\frac{1}{2}$ dollars.

The CHAIRMAN observed that although the very small steamer, the *Ma Robert*, had been found by Dr. Livingstone to be too weak for the navigation of the Zambesi, no reflection could be cast upon her builder. That vessel had been constructed upon a given plan and for a particular purpose; and before she went out she was approved of by the Admiralty. But it had been found that this vessel was inadequate to do the work; her cabin was half water logged, and her bottom so full of holes that if Dr. Livingstone did not receive another vessel from the British Government, he must (as he wrote to his friends) procure one out of his own small means. This, however, he (the Chairman) felt confident the British nation would not allow; and he had great satisfaction in saying that Lord John Russell supported the request of Dr. Livingstone, and desired to furnish him with a new vessel.

Mr. J. MACQUEEN, F.R.G.S., said,—The important papers just read offer a wide field for observation. At this late hour, however, it is impossible to enter upon the consideration of their contents to the extent I could wish. I must glance at them hastily, taking the geographical features properly first.

The River Chire, Xire, or Shiré, is no new discovery. It has been known to the Portuguese for more than two centuries as a large and important river, up which they formerly traded to a distance of thirty days' journey. It was known to have in some places rapids and cataracts. The early Portuguese travellers and writers called the name of the lower part of the river and the country around it Sherawa. They further called it the Nhanja in its upper course. Lacerda, Monteiro, and others decidedly and repeatedly state this, while they also decidedly give their opinion from what they considered good information that the river which passes the capital of Cazembe was the head stream thereof, and which is probably the fact. The northern Lake Nhanja alluded to by Dr. Livingstone is not a lake but a large river, called Nionja or Nhionja, which is in about lat. 14° S. and long. 36° E.; when crossed by Silva Porto in 1854, it was on the 29th of April, towards the close of the rainy season, one mile broad.

In this sense Father Codinho mentions this lake (*Lago*: this word means fen, marsh, or a sheet of water which expands and contracts, or dries up, according to seasons and circumstances) in his *Travels to India* in 1663, and which, on the information of an intelligent Portuguese explorer, who had travelled over all that portion of Africa, and made a map thereof, is laid down as extending from 15° 50' S. lat., and called by him Zachaf. It communicated with the lower Zambesi below Senna, while its source came from a vast distance to the north. I feel obliged to Sir Roderick Murchison for calling my attention to a large manuscript map of the world now in the British Museum, and made by Antonio Sances, a Portuguese, in 1623. Thereon every part of the whole coast of Africa is laid down, with even greater accuracy than it is at the present day. That map has a lake lying due west from Quiloa, and in the position of what is at present called Lake Nyassa, and from this lake the great branch of the Zambesi, the Shiré, or Zachaf, is made to flow. Farther, that map gives the source of the White Nile at the foot of exceedingly high mountains close upon the Equator, and almost exactly as modern discovery shows it to be; its upper course also is delineated nearly as it is at present known, and has been pointed out to the Society by Mr. Macqueen in his paper presented last session.

It is not at all likely that the enterprising Portuguese would not know the capabilities of a river which they had known and included in their dominions for more than 200 years. The Zambesi was well known to them to a great distance beyond or above Zumbo, and they have always told us that the river was not fit for unobstructed commercial navigation, and that near Chocwa it was always said to be impassable. Dr. Livingstone has given us more minute information about the obstructions in some parts than they have done, but as regards the main point he gives us no more than is known, nor shows how difficulties that exist can be overcome. If a steamer drawing 2 feet water cannot move with safety, it is clear that another drawing 6 feet or 10 feet with proportionate power would never venture upon those ebb places, narrow channels, and terrible rapids with the slightest chance of success.

It is useless to shut our eyes to the fact that the expedition in its great object, namely, the exploration of the Zambesi as a valuable commercial channel, has for the present completely failed. The steamer, we are told, is not fit for the service. Be it so; but then it remains to remark where is the judgment which sent out a vessel 80 feet long and a hull only $\frac{1}{8}$ of an inch thick on such an unknown and dangerous service to stem a stream running at the rate of 10 miles or more per hour, and to a country where no repairs could be effected?

Besides a heavy load of sugar manufacturing machinery, the vessel with such a thin skin had a ton of gunpowder on board.

We have seen the difficulties and dangers of the navigation of the river from the cataract above Tete. From Zumbo to the sea, a distance of 480 miles, the decline according to Dr. Livingstone is 1440 feet, or about 3 feet to the mile. But what must the difficulties and dangers be from Zumbo to the mouth of the Chobe, a distance of 360 miles, where the ascent of the river is 2101 feet, or equal to 6 feet per mile? It is well known that the rapids and cataracts in that space are numerous and great.

I am, I must confess, surprised at the noise made about sugar and cotton cultivation in Africa as being something new. Why, these agricultural productions grow in the greatest abundance all over Tropical Africa, and in many places to a greater extent than round the banks of the Lower Zambesi. In some places cotton cloth forms the currency of nations, and in almost all places the natives manufacture their own clothes from the wool. It was from Africa that the sugar cane was first carried to the Brazils and thence to the West India. Jabboo cotton cloth has for more than 200 years formed a large article of export from the Bight of Benin to the Brazils. It is much stronger than European cloth, from the staple of the cotton being longer and finer than that which is elsewhere obtained. The absurdity of sending American cotton seed to Africa to raise cotton is just upon a par with our knowledge of other African affairs. Coffee, all know, is most abundant in Africa. Enarea and Kaffa are, it may be said, its native country, and most of the coffee that comes from Mocha and that is called Mocha coffee comes from the quarter of Africa mentioned, while the whole Eastern Horn of Africa is and has been known for more than thirty centuries to be literally covered with frankincense.

Africa is a splendid field for European enterprise, but to make that enterprise successful we must begin on commanding positions near the sea coast. To attempt to raise bulky articles in the interior, 700 miles from the sea, without any roads or easy navigation to reach the spot, is the wildest delusion that ever entered the human brain, even were the lands ours—which they are not—while it must be by African hands, not European, that cultivation in Africa must be carried on. Attempts made in any other way must prove, as these have hitherto done, complete failures.

It is both ungenerous and unjust to reproach the Portuguese with idleness and the decay of their African colonies. The decline of the colonies of Portugal sprang from the effects of the terrible struggle in which she was engaged side by side with ourselves against the fearful military tyranny and despotism of France, led on by Napoleon the First, and which compelled her patriotic sovereign to seek refuge from his grasp in a distant portion of his colonial empire. But Portugal, though weak, has not lost her rights in Africa. Those rights we acknowledge, and also her authority to place custom houses at her different stations, when this country appoints, as it has done, a consul (Dr. Livingstone) for several of these places, which at once changes his character and acts from those of the Christian missionary to that of a political official agent. Moreover the colonies of Portugal will shortly teach other nations their productive value and importance.

In what I have stated, do not let it be for one moment supposed that I wish to detract from Dr. Livingstone's great labours, merits, and perseverance—perseverance which from my knowledge of tropical climates and countries in my opinion amounts at times to rashness; but to state that the previous labours undertaken and information given by others cannot justly be construed to lessen the value of his, while his opinions on commercial, agricultural, and political subjects may on some points be considered wrong by those practically acquainted as I am with tropical places and cultivation, and the nature and inclination and pursuits of their population.

The CHAIRMAN expressed the hope—notwithstanding the passing criticism of his friend Mr. Crawford—that the extracts which had been read from the communications of Dr. Livingstone would tell cogently in favour of the views of that zealous and able explorer, and induce the public to urge Her Majesty's Government to continue to support the Zambesi expedition which they had set on foot. It had been stated on the high authority of Sir George Grey, the Governor of the Cape, that if anything should happen to cause the failure of this expedition, the fame of which had gone far and wide, the effect upon British interests throughout South Africa would be most detrimental. The consideration of a small sum of money must not be suffered to check the prosecution of this important enterprise. He trusted that the sentiments entertained by the present meeting would have a just influence upon Her Majesty's Government, and would lead them to accelerate those measures which have the full sanction of the Minister for Foreign Affairs.

The CHAIRMAN finally adverted to the recent death of that eminently philosophical and great statesman the Hon. Mountstuart Elphinstone; but no justice could be done to such a name in a few brief sentences, and in due season the President of this Society would no doubt do all honour to the memory of that illustrious man.

At the next meeting, when the subject of the Map of Kashmir would be considered, he would read a letter from Lord Canning relating to the Engineers of India, which did so much credit to the head and heart of the Governor General that he was sure the meeting would hear the communication with much satisfaction.

Third Meeting, Monday, December 12th, 1859.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*Captain H. H. Godwin Austen; the Hon. and Rev. F. S. Grimston; F. W. Davis, M.D., R.N.; H. Harwood Harwood; W. H. Purdon; and Francis Tagart, Esqrs., were presented upon their Election.*

ELECTIONS.—*Captain G. Augustus Bedford, R.N.; Rear-Admiral Sir H. Byam Martin, K.C.B.; Henry Ansell; Edward Butler; Edmund Calvert; William C. Hood, M.D.; Henry Raikes, M.A.; Edward Smith; W. Castle Smith; Richard Todd; and James Watson, Esqrs., were elected Fellows.*

EXHIBITIONS.—The MS. Trigonometrical Survey of Kashmir, by Captain T. G. G. Montgomerie, F.R.G.S., under the direction of Lieut.-Colonel A. Scott Waugh, F.R.G.S., Surveyor-General of India; sketches illustrative of Himalayan scenery, by Captain H. H. G. Austen and Mr. Purdon; numerous sketches of scenery in British Columbia, including San Juan Island, &c., by Mr. Bedwell, R.N.; a map of the Fraser River, by Captain G. H. Richards, R.N., F.R.G.S., of H. M. S. *Plumper*; a plan of the Tien-tsin-ho, showing the Chinese defences, by Major Fisher, R.E.; and a model of the Welcome gold nugget from Ballarat, by Professor Tennant, F.R.G.S., were exhibited.

Prior to commencing the Paper on Kashmir, the Chairman read the following letter from Lord Canning, the Governor-General of India :—

DEAR SIR RODERICK,

Calcutta, Aug. 29th, 1859.

Last month I sent to the Secretary of State for India the first sheet of the Great Trigonometrical Survey of Kashmir, the work of Captain Montgomerie, of the Bengal Engineers, done under the superintendence of Colonel Waugh, the Surveyor-General of India.

To my unlearned eye it is as fine an example of topographical drawing as I have ever seen, though the subject is one upon which I do not pretend to be an expert judge.

But I can speak to the difficulties under which Captain Montgomerie's task has been accomplished: not the physical difficulties of the ground only, but the awful discouragement and anxiety of finding himself almost alone in those wild mountains, the people of which had, to say the least, no sympathy with the English rule in India, and surrounded by Hindostanee sepoy, whose comrades and relatives were amongst the most active movers in the chaos of murder and rebellion which was boiling in the plains below. You, perhaps, have heard that, at Roorkee, the head-quarters of the Sappers, and at the foot of the Himalayas, the men of that corps, early in the mutiny, shot their commanding-officer at the head of his column, and joined the ranks of the rebels.

Captain Montgomerie, however, by his own courage and tact, not only kept his men (soldiers of that same regiment) under discipline and got good work out of them, but brought them back loyal and attached to the service. They have now good cause to thank him.

I know that these incidents add nothing to Captain Montgomerie's claims to notice on scientific grounds; but if, as I hope may be the case, the Royal Geographical Society should consider that his labours deserve to be noticed for their result, the circumstances under which they were carried out may perhaps be taken into account. If the Society think this young officer worthy of any honour, I shall greatly rejoice, both for his own sake and for that of the distinguished corps to which he belongs. I believe that there does not exist under any Government in the world a body of officers surpassing that of the Engineers of the Indian Army in the combination of high intellectual ability and acquirements with the most daring and persevering courage, if indeed there be any equal to it.

I wish I had been able to push forward the Geological Survey more rapidly, in accordance with your exhortations of four years ago. But the last two years and a half have given me other things to think of, and, which is worse, other things whereupon to spend our money; even you yourself, had you been here, would have had to turn your hammer once more into a sword. I hope, however, to get some practical benefit out of the Kumaon iron district very shortly, in the shape of castings (wrought iron will be a longer job), and the recent discovery of the extent, much greater than was known, of useful coal-fields, not far from the line of the East India Railway in Lower Bengal, is a very welcome incident. On the other hand, I am sorry to say that I have just received a most discouraging report from Mr. Oldham of the hopelessness of finding coal north-westward of Allahabad.

Believe me, dear Sir Roderick,

Yours very faithfully,

Sir Roderick I. Murchison, &c. &c.,
Belgrave Square.

CANNING.

The Papers read were—

1. *On the Trigonometrical Survey and Physical Configuration of the Valley of Kashmir.* By WILLIAM H. PURDON, Esq., F.R.G.S., Executive Engineer, Punjab.

Communicated by SIR CHARLES WOOD, Bart., M.P., F.R.G.S., India Office.

THE valley of Kashmir is somewhat of an oval form, 89 miles long, from 10 to 35 in width, and upwards of 5000 feet above the sea. It is surrounded by a magnificent cordillera of mountains, snow clad during eight months of the year, whose highest ridge is usually from 10 to 20 miles from their bases. The monarch of all of them is the bare mass of the Diarmal; no snow can cling to it on account of the steepness of its sides; it rises to 26,629 feet above the sea, and forms the culminating point of a vast mountain mass which exceeds 20,000 feet in height in a radius of 15 miles around it. It is 900 miles distant from the great Mount Everest, and lies on the range of the true Himalaya, that, even in this latitude, asserts its great superiority over all other mountain ranges in the world.

The defile by which the river, that drains the valley of Kashmir, finds its exit, is also on the grandest scale. The chain of the Himalaya is there cleft by a great chasm, whose almost perpendicular sides are 7000 feet in depth. The bottom of the chasm is wholly occupied by the river; its entire volume being constricted to a width of only 70 feet in one place, and its waters gliding for 10 miles, with astonishing velocity, in an unbroken stream. After this point the river becomes a succession of rapids and a sheet of foam, forming a fine contrast to the dark forests of oaks, planes, and cedars, which here clothe its banks to the very edge of the waters. It is probable that these cedar forests furnished the fleet of Nearchus upwards of twenty centuries ago; and it is from them that the Punjab still obtains its chief supply of this almost imperishable timber.

Mr. Purdon describes at considerable length the history and the geological features of the valley of Kashmir, and he dwells upon the difficulties, the importance, and the magnitude of the operations of the Great Trigonometrical Survey of India.

THE CHAIRMAN said that, in the paper, a portion of which had been read, the writer had embraced many things which went far beyond the mere description of the very beautiful map suspended upon the wall, and made special and most useful reference to the geology of the region he was describing. The map which represented the physical features of the country was worthy of very special attention. It had been constructed under the direction of Colonel Waugh by Captain Montgomerie, and one of the most active persons in its compilation, besides Mr. Purdon, was his young friend Captain Godwin Austen.

The last-named gentleman has just handed in a paper, additional to the one, a part of which the meeting had listened to, relating to the more mountainous part of Kashmir, which time would not allow of being read, but which would be shortly printed in the Journal of the Society: though perhaps Captain Godwin Austen would like to address the meeting. He was happy to state that Colonel Everest, so distinguished as the former director of the Great Trigonometrical Survey of India, was present, and also Mr. Vigne, who had published the best map of the country that had been hitherto prepared.

COLONEL GEORGE EVEREST, V.P.R.G.S., felt exceedingly indebted to Sir Roderick Murchison for the handsome way in which he had spoken of him. For twenty-five years of his life he had been connected with the trigonometrical survey of India, and took great interest in his old department. For the first five years he was associated with Colonel Lambton, whom he succeeded, and two years afterwards was obliged to come to England on account of his health. While in this country he obtained some most perfect instruments, and returned to India. But, at the commencement of 1830, he had nobody there that could use them, and had to train all his assistants. It was the most fortunate event of his life that he met with gentlemen like Colonel Waugh and Major Renny Tailyour, each of whom possessed great ability and extreme willingness to learn; and, on retiring from the survey, he was satisfied that he left the work in the most efficient hands. The department, whether personal or material, was in the highest order; it was a fine establishment, and possessed of some of the best instruments in the whole world. The beautiful map behind the chair, which could not be characterised in terms that were too high, was a good proof of the knowledge and skill employed in the survey. By reference to the triangulation they would better understand the degree of excellence which had been attained. The great object of a trigonometrical survey was to prevent the accumulation of error. If a number of trigonometrical points, determined with sufficient accuracy, were placed in different localities, there could be no error beyond those points. All the principal triangles, moreover, were arranged into polygonal forms, so as, by mutual compensation, to eliminate each other's errors, whether personal or instrumental, from which no observations can pretend to be entirely free. An error of fifty feet in the position of an internal point might be made; and in fact, in latitudes and longitudes limited to the nearest second, such errors are inevitable, seeing that one second of latitude is equivalent to about 102 feet, but it can go no further, for the linear dimensions of the principal triangles are retained, and are not subject to this objection, so that errors cannot accumulate.

CAPTAIN H. GODWIN AUSTEN, F.R.G.S., declined to speak, but presented his paper on the same subject, expressing his hope that it might prove acceptable to the Society.

MR. G. T. VIGNE, F.R.G.S., also expressed his grateful thanks for the flattering notice of his map, and the results of his travels in Kashmir, &c., and added, that he considered the completion of the G. T. S. Map (which seemed to him as beautiful as it was accurate) was no ordinary subject for congratulation. He was not without hopes that the public might now be induced to view the acquisition of Kashmir (by fair means) in the same light as he had always done. It was actually part of the Punjab, and he had always considered it as a place of great importance to the security of our north-western frontier in India. Possessed of a European climate, it was at once a fortress, a dépôt, and a sanatorium. It would be a miniature England in the heart of Asia, and there would there be English racing, English farming, English mining, English fox-hunting, and English cricket; and, with a good road through the Baramula Pass, a British force in the highest state of health and appointment could, in a very few days, be marched thence to deploy along the banks of the Indus, or meet any invader in the passes of Afghanistan.

MR. J. GERSTENBERG, F.R.G.S., said that it was of the greatest interest to the Society to find that important geographical researches are undertaken, not exclusively for the purpose of ascertaining the configuration of the earth, but also with a view to the practical application of the knowledge acquired for accelerating intercommunication, for the extension of commerce, and for the general benefit of mankind. It is, therefore, most gratifying to us to have just heard, that during the trigonometrical survey of India, over the stupendous extent of upwards of one million of square miles, not only the relative altitudes were fixed, but also the most favourable localities were ascertained for the introduction of railways and canals. The surveyors should also carefully examine the climatic condition of the various localities for the purpose of transplanting such products as might be successfully cultivated there, and for the supply of which we are now chiefly dependent upon foreign countries. This has been satisfactorily accomplished with respect to tea, by its introduction into Assam, and with regard to cotton by transplanting various species into several districts of India. But there is another article, yet more necessary than food and clothing, for it constitutes the sole remedy against the deadly attacks of fever in tropical countries, to which enemy so many of our valiant soldiers succumb—I mean quinine. The British Government pay for this medicament about 60,000*l.* annually, and we are entirely dependent for its supply upon South America, in which country alone it is at present produced. He was most happy to state, that the Indian Government, urged by a British commercial corporation, of which he had the honour to be a member, have at last consented to carry out the important project of transplanting the quinine yielding cinchona tree to suitable localities of the Indian empire, and that Mr. Markham, a Fellow of this Society, was one of the gentlemen to whom the execution of this interesting enterprise has been intrusted.

The second Paper read was—

2. *British Columbia. Journeys in the Districts bordering on the Fraser, Thompson, and Harrison Rivers.* By Lieuts. MAYNE, R.N., and PALMER, R.E., and Chief-Justice M. BEGGIE.

Communicated by the DUKE of NEWCASTLE, Colonial Office.

THE above communications are written at considerable length, and are so largely occupied with the description of numerous but essential details, that it is impossible to do justice to them in so short an abstract as the following, especially without the assistance of a map.

Lieutenant Palmer was ordered by Colonel Moody to make an engineering reconnaissance of the neighbourhood of Fraser River. He reports minutely on the steps that should be taken at each point of his route in order to make a good communication for cart or boat traffic. He has fixed the geographical positions of numerous places, and he gives a detailed account of all the patches of land available for cultivation which fell under his notice. His report is accompanied by six explanatory plans and three photographic views.

Lieutenant Mayne was detached from H.M.S. *Plumper* by order of Captain Richards on a somewhat similar errand to that above

mentioned. He also has brought back a large amount of local information, numerous mineral specimens, and an explanatory map of the country he visited.

Mr. Justice Begbie, who had held a circuit in these same districts, and had seized the opportunity of making a reconnaissance of them, also reports the results of his observations as to the capabilities of the country for transit, the ground suitable for cultivation, &c.

In speaking of some mutual complaints between whites and Indians that were made to him at a village on the Upper Fraser, he goes on to say :—

“On the other hand, many cases of cattle stealing were alleged by the whites of all nations against the Indians, and stealing, indeed, of anything which could by possibility be eaten. For even the cattle which Indians stole they did not attempt to sell or make use of otherwise than as food, and it was admitted on all hands that many hundreds of Indians had died of absolute starvation during the winter. The Indians said that the salmon had failed them now for three years together. The whites alleged, what is obvious to everybody, that the Indians are extremely averse to work, except under the pressure of immediate hunger, and that they are so improvident as rarely to look beyond the wants of a day, and never to consider the wants of a winter beforehand. If I may venture an opinion, I should say this is much more true of the savages who have never been brought into contact with civilization than with those who have had even a little acquaintance with the whites. We found almost everywhere Indians willing to labour hard for wages, bargaining acutely for them, and perfectly acquainted with gold dust and the minute weights for measuring one and two dollars' worth. The circumstances are inconsistent with an utter heedlessness for next day's requirements, for in all cases we had to find these Indians in provisions as well as wages; and the amount for the most abject drudgery to which human labour can be put, viz. carrying burdens, being 8s. per day and provisions, pretty uniformly wherever we went, shows of itself a very high average rate of profit as the wages of labour in British Columbia. If this is the average remuneration of the most unskilled, what ought skilled labour, supported by capital, to earn? It was the uniform practice of storekeepers to entrust these Indians with their goods, generally 100 lbs. of flour, beans, or pork, and provisions for their own subsistence. Thefts were said to be unknown, and great care taken of their burthens; and these individuals who work I found extremely fleshy and hearty. My impression of the Indian population is, that they have far more natural intelligence, honesty, and good manners than the lowest class—say the agricultural and mining population—of any European country I ever visited, England included.”

Mr. Justice Begbie's recapitulation of the chief points he observed were :—

“1st. The ready submission of a foreign population to the declaration of the will of the Executive, when expressed clearly and discreetly, however contrary to their wishes. 2nd. The great preponderance of the Californian or Californianized element of the population and the paucity of British subjects. 3rd. The great riches, both auriferous and agricultural, of the country. 4th. The great want of some fixity of tenure for agricultural purposes; and 5th. The absence of all means of communication, except by foaming torrents in canoes or over goat-tracks on foot, which renders all productions of the

country—except such as, like gold, can be carried with great ease in small weight and compass—practically valueless.”

The CHAIRMAN, in behalf of the Society, returned thanks to his Grace the Duke of Newcastle for his kindness in sending these communications, and also to Lieutenants Mayne and Palmer and Chief Justice Begbie, who had prepared them, and to whom geographers were highly indebted for papers descriptive of this slightly-known country. On looking over the accompanying pictorial sketches, it was evident that vessels of some size could ascend high up the rivers,—a fact which greatly increased the value of British Columbia. It was very gratifying to see young officers of the navy employed in examining and developing that great distant colony of the British empire, and he was especially pleased to find that one of those so distinguished was the son of his friend Sir Richard Mayne. The red line on the map indicated the separation between the mainland of the United States and that of the British territory; and in carrying the line eastwards down the river Columbia to the island of San Juan, it must be obvious to every one that it was of the highest importance to England that she should possess a free transit of her auriferous and other products from the Fraser River and its affluents, by the mouth of the Columbia, to the Pacific. In looking at the map suspended before them, the attention of the Society was also naturally called to those passes of the Rocky Mountains which Captain Palliser and his associates had traversed, and also to the point (Fort Colville) at which they had recently arrived; and it was to be hoped that, before this session closed, geographers would be in possession of much valuable information respecting the interior of this vast country, apparently so rich in gold. He regretted that the engineer officer, the chief of the survey along the British frontier, Colonel Hawkins, had been prevented from being present.

SIR EDWARD BELCHER, R.N., F.R.G.S., on being called upon, said that he regretted he could not afford any information about the district in question, and little even about the coasts of Vancouver Island, as he had not touched on the coast beyond Nootka Sound. When he was there, in 1838, he found the natives were cultivating potatoes, and he afterwards learned that they sold them at very low prices to the whalers: further, that they were imported by these vessels to the Sandwich Islands, where they were in great demand.

The point, however, which caused him much concern was the limiting boundary on the 49th parallel.

In the year 1838, by direct instructions from the Home Government, as well as confidential instructions from the naval Commander-in-Chief in the Pacific, it became his duty to report on the Oregon question, and at that period so little was our Government aware of the true state of affairs that in his instructions he was taught to expect that he would find the English located on the northern bank and Americans on the south, and he was cautioned particularly not to give any ground for offence on the part of the latter. This division at that period, it would be seen, pointed out the Oregon as our natural boundary, confining us more nearly to the 46th, instead of the 49th, parallel; but, to his surprise, he found the British colours flying on Fort George, on the southern side of the entrance, and not a single American located on the whole line of the Oregon up to the Hudson Bay settlement at Fort Vancouver! On his arrival there he learned that the temporary Governor had not only permitted but invited American missionaries to settle on the Wallamette (a southern tributary, but in the Hudson Bay territory), and, moreover, had provided them with seed, sheep,* and every facility for forming a settlement.

* At this period such supplies were so *niggardly withheld* from Her Majesty's ships, as to cause the other officers of the Hudson Bay Company, at Fort Vancouver, to openly reprobate the conduct of their chief!

At length, when a sufficient number had become located (a body, he believes, came across the Rocky Mountains), they petitioned the American Government to afford the necessary protection to American citizens, and thus it was that British rule was ousted from the Columbia or Oregon River.* Immediately subsequent to this he visited Monterey, California, where an insurrection had taken place, and they had declared themselves independent of Mexico. The American Consul there had married the daughter of the then President. He had informed him that "his instructions fully warranted him in stating that the American Government expected the Oregon question was in my hands, that it was to be settled that year, and that if the British Government was disposed to meet the question in a fair spirit, the American Government would not offer any objection to California being held by Great Britain for the Mexican debt" (at this period the revolutionary chiefs were disposed to ally themselves to England).

On his reaching San Blas the Vice-Consul informed him that he had been requested by the Minister at Mexico to apply to him for the fullest information on all these matters, and he was assured by him (Mr. Barron) that the tenor of his despatch to the Home Government—a copy of which was furnished to him—would prove most satisfactory (this was as from confidential communications with the Embassy). It was subsequently intimated to him, "That as he was a Commander in the Navy, and had travelled out of his province in communicating direct on such subjects, no notice would be taken of it." The result fully verified the remark. England lost California, the Oregon, and was, to use a nautical phrase, "fleeted up" to the 49th degree.

If the British Government had acted with becoming prudence in 1838, and had viewed well the ground before ceding the Hudson Bay territory, the San Juan difficulty never would have presented itself. We had literally been shouldered out of the Oregon territory by the over-zealous desire of this Sub-Governor of Fort Vancouver to introduce American missionaries into the rich lands of the Wallamette.

DR. HODGKIN, F.R.G.S., was struck with the statement of one of the writers that the Indian population were destitute of forethought, and made no provision for winter and coming wants. He thought that if the gentlemen employed by Government in these distant services had previously made themselves better acquainted with ethnology, their reports would have been somewhat modified. The early accounts of the natives of North-Western America showed that in the construction of their dwellings and in the curing of fish, &c., they were both disposed and able to provide for their wants. He was, therefore, forced to conclude that their present improvidence was the result of their deterioration by the more recent increased communication with whites (fur-traders and gold-seekers). The fact that some were now employed in work proved that they might be useful to themselves and others in this important but too long neglected portion of the British empire.

He was glad to be able to say that the present Secretary of State for the Colonies, and his predecessor Sir Edward Bulwer Lytton, had taken a warm interest in the aboriginal tribes in that quarter, and he felt assured that, if properly treated and instructed, the native population would prove of great advantage to the settlers who now, whilst seeking gold, can only obtain the means of subsistence at exorbitant prices.

Intimately connected with this territory was the proposed railway passing through British North America, and connecting the Atlantic with the Pacific Ocean; and if England did not throw away her money in rifle-clubs and the like expenses, she might easily find the means of making this line, which

* Vide p. 297, *Voyage of Sulphur, 1837 to 1842*; and for a complete history of the Oregon, vide Washington Irving's '*Astoria*.'

should be regarded as one of the most important in the globe. Our fellow-member, James Macqueen, so well known by his African labours, had been long devoted to this object.

He would mention as bearing on this subject that Captain W. Kennedy, the commander of one of the late Arctic expeditions, who was partly an Indian by birth, had since the last meeting left England for the express purpose of forming, in conjunction with one of the chiefs, of excellent probity and character, a civilized Indian settlement near the Lake of the Woods, and on the probable line of route. It well deserved all the support and encouragement which could be given to it.

MR. JOHN CRAWFURD, F.R.G.S., would not recommend anybody to go particularly to New Columbia for gold-digging. He should not like to take up a residence there himself in preference to many other places in America and Australia. With regard to the San Juan difficulty, it was monstrous to suppose that two countries, having millions of square miles of land at their disposal, and bound together by such ties as those of America and England, should go to war about that paltry little island. They were respectively bound, moreover, under a penalty of 20,000,000*l.* per annum to keep the peace: 20,000,000*l.* worth of American cotton, tobacco, and corn, came to England every year, and 20,000,000*l.* worth of English manufactures went to America. It was ridiculous, therefore, to suppose that war would result from the little unpleasantness that had arisen about a small island. He did not agree with Dr. Hodgkin about the volunteer question. He thought the movement an excellent one, and would observe that they did not owe it to the Government but to the press of the country, and especially to the *Times* newspaper: in fact, it might be said that the press had done it all. He believed the whole of the gold yearly produced by New Columbia was not more than half a million sterling—the twenty-fourth part of what Australia had been yielding for the last eight or ten years. It was not that gold did not abound in New Columbia, for there was not the least doubt but that it did, over very extensive fields rich in yield; there were however physical and he hoped only temporary obstacles to its cheap production. At the commencement of the Californian and Australian gold discoveries many people were in terror that we would be ruined by the influx of gold—injured by too much gold; but the fact was, that although gold and silver had been added to our previous supply to the yearly amount of some 50,000,000*l.*, it had produced no diminution whatever in the value of the precious metals, while commerce had been vastly promoted by it. In reality, the new supply was so much capital added to the previous capital of the world. And it was worthy of remark that silver had kept pace with gold, so that there was no relative disproportion in the value of the two metals, and this was principally owing to the discovery of quicksilver mines in California, upon the price of which the productiveness of the mines of silver always depended.

The CHAIRMAN said that many years ago he had ventured to express the opinion in various writings, and in a lecture delivered at the Royal Institution, that there need be no apprehension of having too much of a good thing, by the discoveries of enormous accumulations of gold; and the result up to the present time seemed to have proved the opinion to have been sound.

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PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY
OF LONDON.

SESSION 1859-60.

Fourth Meeting, Monday, January 9th, 1860.

THE EARL DE GREY AND RIPON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Captain G. A. Bedford, R.N.; Richard Cull; John P. Gassiot, jun.; G. Gilbert-Heard; and Lieut. A. W. Twyford, Esqrs., were presented upon their election.*

ELECTIONS.—*Sir Andrew Agnew, Bart., M.P.; Captain Claude Clerk; the Hon. W. H. Forester Denison, M.P.; Captain J. Hamilton Ward, R.N.; Edward Enfield; H. Hamilton Lindsay; C. Otter; and J. Petherick, Esqrs., were elected Fellows.*

ACCESSIONS.—Among the accessions to the Library and Map Rooms since the former meeting were a copy of Purchas' 'Pilgrimes,' in 5 vols., presented by John Crawford, Esq., F.R.G.S.; map, with views and sections, of the Kankasus and adjoining provinces, with book explanatory of the survey (in Russian), by the Chevalier de Baer, Hon. F.R.G.S.

The Paper read was—

Journey up the White Nile to the Equator, and Travels in the Interior of Africa, in the years 1857-58. By J. PETHERICK, Esq., F.R.G.S., H.M.'s Consul at Khartum.

MR. PETHERICK's first expedition was in 1853, to the extreme confines of the Bahr el Ghazal, where his negro attendants refused to proceed farther, and compelled him to return.

The next year he took an armed force in two boats, and landed where he had before turned back, and pushed overland into the Djour country. There he left 25 men to form a trading establishment.

Each succeeding year similar advances were made, and new trading posts were founded.

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On the 27th of December, 1857, Mr. Petherick sailed from Khartum on his last and most important expedition. He started with two boats, the one a large three-sailed dahabieh, and took with him about 80 men in all. He had previously dispatched 20 men in a third boat to await him at the Bahr el Ghazal.

He reached this lake in 11 days from Khartum. The White Nile, on leaving it, was only 40 yards wide, 15 to 20 feet deep, and running at $\frac{1}{4}$ mile an hour. The lake is a large sheet of water, estimated by Mr. Petherick at about 180 miles in length, overgrown with reeds and lilies, and full of hippopotami, that are even dangerous to boats from their fierceness. The waters of the lake are contributed by many rivulets and by a river running from the south-west, which is prevented only by the masses of reeds that choke it, from affording a navigable highway to the far interior.

Mr. Petherick skirted the northern shore of the Bahr el Ghazal. It was covered with coarse rank grass, and was apparently uninhabited. The expedition anchored at an island at the extreme end of the lake, where he formed a *dépôt*. From this point Mr. Petherick proceeded direct to the southward, with a strong native escort, well armed, and carrying beads and other articles of barter.

The first seven days' march from the lake, lay through strictly pastoral tribes. South of these the *tset-se* fly appeared, and the natives were wholly agricultural. There was difficulty in travelling among them, as it was impossible to engage porters for greater distances than single days' marches and from village to village.

Twenty-six days of actual travel, from the lake, brought Mr. Petherick to the Niam Niam tribe of cannibals. These people use iron boomerangs, just as the natives of Australia use wooden ones. Here the rains commence in February and last to the end of October.

This was Mr. Petherick's farthest point, whence, after a successful barter for ivory, he returned and reached his boats in safety.

The difficulties and danger of travel in these parts, are brought out in strong relief by the incidents of the personal narrative, contained in Mr. Petherick's paper.

The PRESIDENT was sure he should express not only his own feelings, but those of the meeting also, when he said that they were very much indebted to Mr. Consul Petherick for the very interesting paper which he had just read. It was marked by that spirit of commercial enterprise which was peculiarly the characteristic of our country, and from which undoubtedly the Society had upon so many occasions derived the greatest advantage. It was curious that as their attention had recently been directed to a neighbouring portion of the Continent of Africa, they should now have Mr. Petherick coming among them to read a paper which might be said to form almost the necessary complement to those which, during the last Session, had been communicated to them by Captains Burton and Speke. They might fairly hope now that by

the efforts of their countrymen, one proceeding from the north to the south, and the other from the south-east to the north-west, the course of that great river, so remarkable in an historical and a geographical point of view, the Nile, might, at no distant period, be traced out and satisfactorily established by the investigations of Englishmen in connexion with this Society. He was very happy to be able to announce that Her Majesty's Government had been pleased to grant to the Society, in support of Captain Speke's intended expedition, the sum of 2500*l*. This amount had been awarded in a manner that must be most satisfactory to the Society, because it had been handed over to the Council to be expended entirely at their own discretion. While Captain Speke then would proceed to finish the explorations that were begun in his previous expedition under Captain Burton, he trusted that Mr. Petherick would continue in an opposite direction those of which he had just given some account, and he hoped the time might not be far distant when these two distinguished explorers might meet and greet each other, arriving from different directions, on the banks of the White Nile. He was glad to avail himself of this opportunity to express the hope that Her Majesty's Consul in those parts might receive from Government that support to which they, as geographers, must feel that he was fully entitled.

CAPTAIN J. H. SPEKE, F.R.G.S., could not say positively that any decided relation existed between the Bahr-el-Ghazal and the Victoria Nyanza.

All the branches of the Upper Nile appeared to him to have their heads directed south-easterly, tending towards the Nyanza, but more especially so the Bahr-el-Ghazal from the position in 4° N. lat. where Mr. Petherick crossed it.

The granitic hills which Mr. Petherick here sees out-cropping to an altitude of 2000 feet above the level of the northern country, might be a continuation of the same description of hills we hear of at Gondokoro, on the White Nile, also in 4° N. lat. If this were the case, it was evident the whole country has, thence northward to the Mediterranean, an evenly declining slope from 2000 feet to the sea-level. Of this fact the analogous descriptions of the sluggish nature of the two great streams in a measure bear proof.

These hills appeared to form a kind of steppe in the country, and act as a support to the great interior plateau, which is about 4000 feet above the sea, as was determined by him on discovering the Nyanza, which is at that altitude, and lies about 200 miles or so to the immediate southward of the range. As these two streams, the Bahr-el-Ghazal and Bahr-el-Abiad, have both been seen to intersect this range, and as a third large river, called Lout or Modj, which, as well as the former two, comes from the direction of the Lake, it would be a pure matter of speculation to say which of the three may drain the Nyanza. Indeed until some one goes there to examine the country nothing could be determined.

From the relative position of the Lake to these streams, as well as the general character and appearance of the Lake itself, Captain Speke was still of the conviction that it will eventually prove to be the principal source of the Nile.

SIR RODERICK MURCHISON, V.P.R.G.S., congratulated the Society upon the value of the communication made that evening. The President had very properly called their attention to the great object of all the African explorations, particularly those concerning the sources of the Nile, with which the Geographical Society had been occupied for several years. He believed that civilization could only be introduced into Africa by showing to its inhabitants that we were anxious to deal with them fairly and equitably. Dr. Livingstone had often told him that the first step to be taken in civilizing the African was to barter fairly with him, and teach him that he could gain much by attaching himself to an honest Englishman.

Mr. Petherick had not adverted to several topics on which he (Sir R.) might have said a few words. In one portion of his travels Mr. Petherick had collected various minerals and ores; and though the region of Africa which he had traversed was not occupied by those ancient rocks which, for the most part, furnish gold and other minerals of importance, still in one of these regions he had collected masses of clay which, having been analysed by Dr. Percy of the Government School of Mines, had proved to contain a considerable portion of gold ore, and he hoped his friend Mr. Petherick might be the first to profit by it. In conclusion he heartily hoped that the scheme of developing the true source of the White Nile, which they had in hand, might be so accomplished that we should be the first people who really discovered the sources of the great historical river. Whether those sources rise farther to the west than the great Lake Nyanza which Captain Speke had discovered, or whether the main source was, as is most probable, that lake itself, he was quite sure that by the new co-operating expeditions which were designed by the Geographical Society, and which he hoped the Government would assist, the discovery would greatly redound to the honour of the nation, and would largely advance geographical knowledge.

COLONEL SYKES, V.P.R.G.S., said the Society had to thank Mr. Petherick for the extremely frank and candid manner in which he had told them what they might and what they might not rely upon in his narrative. With regard to localities, longitudes, latitudes, and the elevation of the country, he stated that he had no means of determining them accurately by the aid of scientific instruments, consequently the western course he had given to the Nile might, in fact, be much more to the eastward, and approximate more to the Lake Nyanza, discovered by Captain Speke, than Mr. Petherick had supposed. They were also indebted to Mr. Petherick for the politic and humane lesson he had brought to their notice, and which might be useful elsewhere than in the centre of Africa, namely, that in attempting intercourse with any people whatever, our object should be to convince them in an amicable way that the intercourse was for their own interest as much as for ours, and then we should be sure to gain their good-will, and to have their efficient and useful services. But that intercourse which was gained by force of arms could only in general be maintained by force of arms. Captain Speke stated that the southern end of the Lake he discovered, Nyanza, was in about $2\frac{1}{2}$ degrees south latitude, and that he supposed it extended to two or three degrees to the north of the Equator. But as he had only the information of natives who had not definite ideas of distance, it might or might not be true; it might terminate on the Equator—indeed it might terminate in those gravely ramifications of the Nile which a French traveller, on a former expedition, found in 4° north latitude, where the river worked into a great number of small channels extending over a very wide surface, possibly communicating with the reedy lake that Mr. Petherick mentioned, where he quitted the river altogether and then travelled to the southward by land. He was much disposed to think that the elevation of the country north of the Equator which Captain Speke spoke of as being only 2000 feet, would be found to be much higher than that, as the structure of the country did not seem to indicate at all a trap district, or descent by steps or terraces from the height of Lake Nyanza (4000 feet). He concurred rather with Mr. Petherick in supposing that there would be a gradual ascent of the country up to the Equator. On the whole he entertained great hopes that when Mr. Petherick and Captain Speke renewed their travels, they would meet and embrace each other on the Equator, coming from opposite directions, and that they would then find that Mr. Petherick's reedy lake on the Nile and Lake Nyanza had a direct communication with each other.

Mr. CONSUL HANSON (a native of Africa) thought it must have occurred to

everybody that the result developed by the explorations of the two gentlemen who had addressed them, as well as by Dr. Livingstone in his most interesting researches, showed that, instead of the interior of Africa being, as was supposed of old, an uninhabited desert, wherever we went we should find not only vegetation and productiveness, but a teeming population. This perhaps was the great hope with those who had a right to be interested in the future of Africa; and it must be a great encouragement to the Geographical Society that as commerce, cultivation, and Christianity were not only the hope of Africa, but also the elements of a well ordered civilization everywhere, so there was encouragement for those who went forth to discover the resources and capabilities of the country, that they would not be exposed to any sufferings from want, that the populations to which they went were prepared to appreciate the endeavours which they should make for their advancement, and were ready to meet them in the exchange of the commodities which they might mutually have to offer. It struck him that we might have known at this day much more of Africa than we did now. It certainly had not been the fault of Englishmen that we had not known more; he believed it had been the fault of his own countrymen. They knew something of the history of the colony of Sierra Leone; it had been his lot to be located in the neighbourhood of that colony. Some eighteen years ago it was his honour to be sent by the British Government to the Gold Coast, and subsequently to the Republic of Liberia; and now he had recently returned from the Sherboro country, which was very near Sierra Leone. He had been surprised, and even pained, to find that the part of Africa of which we ought to know the most, was the very part of which we knew the least. If they examined any of the charts of the coast to the southward of the colony of Sierra Leone, they would observe that within 120 miles of Freetown (the capital of the colony) there was nothing at all, no indication on the face of any of these charts, to show that beyond 3 miles from the coast anything whatever was known of the country. There were two charts of the Sherboro River. He believed the name was a misnomer; it was not a river, it was a lagoon, which seemed to have been formed by the joint action or rush of waters from four or five considerable rivers that came from the interior and the ocean, throwing up a deposit conjointly. As a proof that it was not a river he might mention that it had two tidal flows; the water ebbed and flowed both ways, and, of course, it could not be a river. But what he meant to say was, that upon the chart of the Sherboro River there was an indication of the embouchure of four other large rivers, but nothing whatever was known of them, and they were all marked down as being unsurveyed. He regretted exceedingly that the character of the duties which he had to perform there prevented his travelling, or making any explorations in the interior; but occasionally it became his duty to go up these rivers in the course of service, and he found, as he went up, that in proportion as he got away from the coast,—in the same proportion did he get away from the malaria district, and get into a healthy climate. He found, as a general rule, that the mangrove belt which skirted the coast might be 20 or 25 miles in extent; beyond that, the traveller began to ascend, and to get into comparatively higher land, beyond the malaria influences. Another fact that had occurred to him was, that the growth of mangrove seemed to be caused by the confluence of fresh and sea water. Where there was fresh water they saw no mangrove, but where the fresh water met the sea there the mangrove grew, and where the mangrove thrived, there you had that peculiar malaria which generated the fevers of the west coast. The great hope of England with reference to Africa was, if possible, to discover some source of supply of cotton for the manufacturing districts of this country. They would observe that Dr. Livingstone stated that in his quarter of Africa he found indigenous cotton growing

in the country without cultivation on the part of the people; they found that the missionaries in Alcockuta, going up the valley of the Niger, observed the same thing; and Mr. Petherick going down the White Nile, from the northward, found the people there growing and manufacturing cotton. And on the Gold Coast very large communities of people were engaged in the production of this article. In the quarter which he had visited he ventured to say that cotton was not only abundant in quantity, but excellent in quality. He found in the country immediately to the interior of Sherboro, that cotton was the great staple article of production; the people there were in the habit of producing and manufacturing it, and the cloths which they manufactured were precisely the same quality as those which we found from the accounts of missionaries up the Niger, and were highly valued by the people. The future of Africa, to which the attention of the scientific world was now directed, might be of more importance in its results and consequences than we could foresee at present. He believed himself that if the slave-trade was ever to be suppressed, if England was ever to derive any advantage from the great sacrifices which she had made in behalf of Africa, it was not so much by means of keeping naval squadrons upon the coast in order to intercept the slave ships, as it was by introducing civilization, by teaching the people how to profit by their labour and make it of value to the civilized world, so that it should be felt that inasmuch as mankind were all of one family, it was only fair to "let kind offices go round."

MR. PETHERICK, in reply to a question, said that the boomerang used by the natives to the most southern point he reached was the same as that used in Australia. When thrown forward it would return to the hand. It was made of iron, was about 15 inches in diameter, and curved.

THE PRESIDENT, in adjourning the meeting, was confident that he might, without fear, congratulate them upon the result of the discussion. It concerned a topic in which, at the present moment, our interest was deeply excited; and we had, he thought, derived very great and valuable information from the Paper which had been read, and the observations to which it had given rise. Among them he thought none had been on every account more interesting than those which had been addressed with so much eloquence and feeling by Mr. Hanson, on behalf, so to speak, of his own fellow countrymen.

Fifth Meeting, Monday, January 23rd, 1860.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*Edward Butler; F. B. Montgomerie; and Charles Otter, Esqrs., were presented upon their election.*

ELECTIONS.—*The Rev. Thomas Butler; the Rev. Thomas F. Cross, D.C.L.; the Rev. C. S. A. Dickinson; the Hon. H. Courtenay Forbes; the Hon. A. Gordon; Lieut. W. Murray; the Rev. J. Owry North; Major H. A. Sarel; Capt. A. E. Wilkinson, B.A.; and John Boustead; C. W. Franks; B. Hennessey; G. H. Inskip, R.N.; William Lake; Thomas Molson, of Montreal; Chas. H. C. Plowden; Henry Rich, M.P.; John D. Trigg; and Frederick Verbeke, Esqrs., were elected Fellows.*

ANNOUNCEMENT.—Before proceeding to the business of the evening, SIR RODERICK MURCHISON called attention to the appeal which had been made to the scientific men of all countries in favour of the Humboldt Foundation at Berlin. The object of the appeal had been misunderstood. It was supposed to be to one country in Germany only. Far from it. It was an appeal to the civilized world—an appeal to every man who had a feeling of respect for the grand researches in which that great man, Alexander de Humboldt, was so long occupied. It was impossible to overestimate in this assembly the importance of a testimonial, the object of which was to encourage and support travels in remote parts by men of all nations, and thus to promote geographical science. General Sabine had written the following letter to the President, which he (Sir R.) would read to the meeting :—

“ To the Earl de Grey and Ripon, President of the Royal Geographical Society.

“ 13, Ashley-place, January 7, 1860.

“ MY LORD,—I beg to enclose fifty copies of the circular of the Berlin Committee of the Humboldt Foundation for distribution (should that step be approved) amongst the members of the Royal Geographical Society. I am aware that your Lordship has already notified your intention of subscribing very handsomely. Should any of the members of the Royal Geographical Society be disposed to subscribe, I shall be very happy to save them the trouble of the transmission of their subscriptions to Berlin, communicating their names either as individuals or as Fellows of the Royal Geographical Society, as they may desire.

“ I remain your Lordship's obedient servant,

“ EDWARD SABINE.”

The subject of the Humboldt testimonial was brought before the British Association for the Advancement of Science at Aberdeen, and a subscription was opened, and liberally headed by its President, the Prince Consort; and having long had the honour of presiding over the Royal Geographical Society of London, he, Sir Roderick, having warmly co-operated, hoped that his associates would readily join in the contributions to carry out this great object.

The Papers read were—

1. *Proposed Railway Route across the Andes from Caldera to Rosario, via Cordova.* By W. WHEELWRIGHT, Esq., F.R.G.S.

THE author reminds us that he has been engaged, for many years, in introducing and constructing railways in the mountainous and broken country of Chile, where he has successfully adopted that system of steep gradients and sharp curves which he relies upon in his present proposal, of crossing the Andes by the San Francisco Pass.

The entire distance from the Pacific on the one side to a water communication with the Atlantic on the other, by the proposed route, is about 1000 miles, which may be divided into the following sections :—

	Miles.
1. Port of Rosario, on the La Plata, to Cordova	250
2. Cordova to the eastern base of the Andes	350
3. Eastern base of the Andes to Junction with Tres Puntos Railway	320
4. Junction with Tres Puntos Railway to Caldera	80
Total length	1000

As regards the first section ; a district of 6 miles in breadth, along its entire length, has been granted by the Argentine Confederation. This land is good for arable purposes, and not to be excelled for grazing.

The second section is still a gradually rising plain, and passes through a region of great wealth, pastoral, agricultural, and mineral. A concession of 3600 square miles has been made here, to the railway.

The third is barren waste throughout, and would depend for its support upon the through traffic. The San Francisco Pass is believed to be always open. For the last nine years it has never been closed by snow. The La Rosas Pass had been examined, but was considered inferior to the San Francisco.

The nature of the difficulties Mr. Wheelwright proposes to cope with are expressed as follows, in the report of his own surveyor :—

“The first point at which the gradient begins to assume a serious character is at the junction of the San Andres and Saipote valleys. Here we find water and vegetation, and for 10 miles the surface of the ground is much cut up and broken by the stream passing through it, and by the debris from the small ravines on either side. Until we reach Maricunga, after leaving the 10th mile, we find but little or no vegetation and no obstruction to a railway, with the exception of a possible tunnel 500 feet in length. This tunnel might be found to be unnecessary upon further inspection. Just beyond Maricunga commence the most serious gradients, and a tunnel of more than half a mile in length will be needed to pass from Moreno's valley to the main valley, but the rest of the work to the Cuesta de los Chilenos will be trifling. To pass the Cuesta another tunnel will be needed, on a grade of 100 feet to the mile ; and its length, for the purposes of estimating, might be stated at 2 miles, although I am inclined to think that an instrumental location would reduce it to one-half. We are now on the central plateau of the Andes. From Laguna Salada to the Rio Llama we rise for 18 miles at the rate of 2 feet per mile, and then, according to the Table, we have a gradient of 619 feet per mile for 3 miles. This, however, could easily be reduced to 200 feet per mile by projecting the line farther to the south, and following the bank of the stream, thus increasing the length to 9 miles instead of 3 miles as it now stands. This heavy gradient has been necessary to reach the plains of Tres Cruces, about 30 miles long and 10 miles broad. We pass through the centre of them over a gently rolling surface for 10 miles, when we bear more to the eastward for the Barancas de las Llamas. These Barancas are a spur from the Las Llamas mountains, and extend quite across the plain to the Volcano range on the other side, and serve as a barrier between the Tres Cruces and

Las Llamas plains. In order to give rise from one plain to the other, heavy works and rather abrupt gradients would be needed; but an instrumental survey would be necessary to determine the character of this work. From this point we fall gradually to the 'Barancas Blancas,' and then rise again to 'Laguna Verde,' the level of which I have assumed at 14,921 feet above the sea. Although the road just described is perfectly practicable, yet a preferable location for gradients, though a more expensive one, could be obtained by keeping more to the north, and skirting the base of the volcanic range, with a gradually ascending gradient, and thus overcome part of the rise of the pass of 'San Francisco.'

"But assuming that it is necessary to pass the level of 'Laguna Verde,' we then have an average rise to the summit of the Pass of but 66 feet per mile for 16½ miles. The descending gradient from here to the 'Sunto del Francisco' is 180 feet to the mile, but, as the location of the railway would be to the north, keeping up along the base of the mountain, an average gradient of 140 feet per mile would be sufficient; while the extreme gradient for overcoming this pass on a straight line, or, in other words, the natural rise of the ground is in no place over 300 feet per mile. From the great width of the pass it is but reasonable to suppose that the gradient could be much reduced by location.

"From 'El Sunto del San Francisco' to Fiambala we find no impediment, with the exception of the Angostura of the 'Las Losas' river, where the stream descends rather abruptly for 5 miles. But I am led to think that a more thorough examination of the country would endorse the opinion that a better line could be found by leaving the valley of Las Losas at Chouchonil and following another valley that joins the Fiambala valley a short distance above the Copacabana, at a town called Suesto."

The CHAIRMAN, in returning thanks to Mr. Wheelwright, observed that the author was well known as having devoted many years of his life to the promotion of commerce in South America. He was the first person to establish steam-navigation in the Pacific, and also to point out and realise the advantages of the transit across the isthmus of Panama. These facts would satisfy them that his paper was not the production of a mere speculator, but contained the project of a man thoroughly acquainted with the material interests of the South-American continent. He proposed to carry a railroad over an altitude equal to the summit of Mont Blanc, by taking advantage of a depression or low passage in that gigantic range of mountains, the Andes. He left it, of course, to practical engineers to speak upon the practicability of such a railroad.

ADMIRAL R. FITZROY, F.R.G.S., had known Mr. Wheelwright for more than a quarter of a century, and he believed there was not a more reliable, discreet, and enterprising person in whom scientific or commercial men might repose confidence. It was in 1834 that Admiral FitzRoy first became acquainted with him in Chile, when he was collecting information with the view of establishing steam communication along the shores of Chile and Peru, and eventually crossing the isthmus of Panama and connecting that isthmus, by steam, with England. At that time Mr. Wheelwright was thought a visionary speculator. A few years passed, and by his own perseverance he gradually established that Pacific coast communication, which, it was well known, had succeeded, and which in the sequel had led to the present communication by steam between the West Indies and the isthmus of Central America with Europe. After establishing steam communication along the coasts of Chile and Peru, he persuaded the Chilean government, assisted by British merchants chiefly, to undertake a railway communication between Valparaiso and Santiago de Chile; and that, too, had succeeded. Since then he had been engaged in establishing railway communication from the harbour of Caldera to the city of

subsequently to a town about thirty miles farther inland than Copiapo, making about eighty miles from the sea. He had carried this line to between 5000 and 6000 feet above the level of the sea—an elevation higher than had been so attained in any other part of the world. From that elevation, up to which locomotive engines were now at work, he had found that practicable gradients could be carried to a height of 16,000 feet above the level of the sea. From that point, after some level space, there was one continued and very gradual slope to the town of Rosario on the river Parana. From Rosario (on the east), sloping thus gradually to the eastern foot of the Cordillera of the Andes, there was scarcely any impediment of nature. Wood and water were abundant, the country was fertile, the climate was healthy, and there were no Indians to molest white people. In short, there was only the employment of capital and adequate encouragement required to carry that portion of the railway to the eastern summit of the Cordillera; and chiefly because on this east side the land slopes so gradually up to within a comparatively short distance of the summit.

For the character of the measurements, so far as barometrical altitudes and distances went, he could vouch that they had been correctly calculated with the proviso of a certain reasonable allowance for small errors in the horizontal distances, which, in so great a length, would not tell much, as the extremes were fixed accurately. The great difficulty of the undertaking lay between the summit of the Cordillera and the highest point at present gained westward of the Andes, between the point 6000 feet above the sea and the summit level of 16,000 feet. Mr. Wheelwright said (from information he had obtained) that there would not be much difficulty, in the opinion of practical miners, and of the engineers already employed on the Copiapo Railway, with respect to the gradients and the nature of the country. There would be less difficulty there than had been already surmounted.

But the commercial part of the question was a very different matter. The practicability of the scheme was based upon the supposition that the materials, and the men, and the money were available.

There was one remarkable feature in the San Francisco Pass, through which it was proposed to take the railway. It was the best pass in the whole range of the Chilean Cordillera of the Andes, and the only one practicable throughout the whole of the year. It was never snowed up; the climate was mild (in 27° s. lat.), so that the snow never lay sufficiently deep to cause an obstacle, nor were the winds or even storms sufficient to drive such quantities of snow into the hollows as to blockade the pass. The pass of the Cumbre, about 11,000 feet in height, nearly opposite to Valparaiso, and another 13,000 or 14,000 feet elevated, were snowed up for three or four months in the year. There was also a good pass nearly opposite to Concepcion, of much lower elevation, but interrupted not only by snow for a great part of the year, but by incursions of the Araucanian Indians.

However, supposing the intervening distance of two or three hundred miles between the 6000 and 16,000 feet levels, to which he had referred, presents insuperable obstacles to the construction of a railway, that portion of the route could easily be crossed by a good waggon road; and such a communication, with the addition of *telegraphic wires*, would be of the greatest possible advantage to the inhabitants of Peru and Chile, of the immense plains to the east of the Andes, and of the whole of Brazil, besides the advantages it would create for the extensive and great intercommunication that would be developed between Australasia and South America. The actual distance from New Zealand, across that part of South America, to Europe, was rather less than the distance by the Isthmus of Central America: and there was another consideration connecting Australasia intimately with Chile, namely—a ship running a few hundred miles to the north from Copiapo, or Caldera, got into the heart of

the trade wind, which would carry her across to Australasia. On the other hand, by running a little to the south from Australia or New Zealand, a ship would get into the south-westerly winds, which would carry her right across to Chile; so that a ship without steam might make the voyage either way in five or six weeks, without having to guard against intervening land, or peculiar danger of any kind, beyond that of an oceanic passage without a hurricane. The question was now in the state at which it well became the Geographical Society to investigate it, and ascertain whether the data put before them were correct, before the project passed into the hands of capitalists who might be disposed to invest large sums of money upon perhaps insufficient information, and be led astray by the plausible assertions of persons themselves mistaken. It seemed to be the honourable duty of the Geographical Society to collect information respecting such great questions, and lay it before the public, in order that those who had capital to employ might embark in the undertaking with more security.

CAPTAIN SULLIVAN, R.N., F.R.G.S., observed, that vessels of 14 feet draught of water could go up the La Plata to Rosario during the greater part of the year, and those of 12 feet at all times. He had taken vessels of 16½ feet much beyond Rosario, when the river was high. Another advantage was, that the effect of the wind in raising the water of the La Plata sometimes reached as high as Rosario; so that vessels would not be delayed for any length of time by a low river, as they are higher up the Parana. Any one who had been in that country and seen the troops of waggons drawn by oxen coming to Buenos Ayres from the upper provinces must be aware of the large traffic that a railway would open up with the interior. There was only one thing that Mr. Wheelwright had, perhaps, understated, and that was the length of the voyage from England to Rosario. Instead of twenty-five days, as that gentleman stated, he thought thirty days at least should be allowed.

MR. W. BOLLAERT, F.R.G.S., wished to direct attention to the circumstance that the pass in the Cordillera would seldom be closed up at an elevation of 16,000 feet, because there was so little moisture in the atmosphere. He had been as high as between 17,000 and 18,000 feet on the Andes to the north of Copiapo, and there was very little or no snow to be seen. The trade winds deposited nearly all their moisture before they reached that region, which was probably the principal cause of the desert country west of the Andes.

MR. W. J. HAMILTON, F.R.G.S., had listened with great interest to the paper, but he confessed he thought it ought rather to have been laid before the Institution of Civil Engineers or the Statistical Society. Although many of the observations in the paper bore upon the physical geography of the country, yet its principal object appeared to be directed to the feasibility of carrying railway communication across the Andes. The impression left upon his mind was, that however practicable it might be to construct a railway across the pampas and plains of South America on the eastern side of the Andes, the enormous elevation of 16,000 feet would render it perfectly impracticable to carry the line over the mountains. The average estimate of gradients mentioned in Mr. Wheelwright's paper was 200 feet per mile, which would give about 1 in 30 as the ruling gradient of the line. He believed that was a gradient which at present must be considered almost impracticable for locomotive engines. On the western coast of India there was a line of railway now constructing, with a gradient of 1 in 37, and it was considered a triumph of engineering skill. He believed 1 in 40 was the steepest gradient which had yet been overcome in Europe.

ADMIRAL FITZROY said the gradient of 1 in 30 referred to was an isolated instance, for a short distance only. It was the steepest gradient on the line. Steeper gradients than 1 in 30 had been overcome in Norway and America by engines with ten wheels—four driving-wheels and six others. They had sur-

mounted gradients of 1 in 25, and even 1 in 23; therefore a gradient of 1 in 30 could not be considered impracticable. Moreover, stationary engines might be used for limited distances, besides inclined planes, assisted by descending weights of mineral from high elevations.

The CHAIRMAN could hardly agree with Mr. Hamilton in considering that this was a topic which the Geographical Society could not entertain. On the contrary, he thought, with Admiral FitzRoy, that the Society was bound to entertain projects of such vast importance.

GENERAL J. E. PORTLOCK, F.R.G.S., thought it right to correct a small error which had been made. It had been observed that 200 feet in a mile was in the proportion of 1 in 30. The English mile, composed of 5280 feet—not the geographical mile—being that used in engineering calculations, 200 feet in a mile would be a little less than 1 in 26½. This fact was noticed with a view of putting the question on the most fair ground, as 1 in 26½ feet is so nearly the same as 1 in 25, stated by Admiral FitzRoy to have been about the steepest slope effected in American railways. The work, therefore, is doubtless one of great difficulty, but, in the opinion of General Portlock, by no means insuperable.

MR. HAMILTON explained that he had taken the nautical mile of 6000 feet. According to General Portlock's calculation, the difficulty would be even greater than he had estimated.

The second Paper read was—

2. *The Curia Muria Islands.* By GEORGE BUIST, LL.D., COR. F.R.G.S., &c.

THIS group, from its many peculiarities always interesting, physically considered, but which might, if presenting no farther claims than this on our attention, have continued neglected as before, has of late become famous from the treasures of guano it was alleged to contain, and from the large sums of money expended with the view of securing these and turning them to account. Though the manure is only found on two of the smallest of the group—Jebeliyah and Hasiki—it was computed to amount, when they were examined in 1852, to 200,000 tons, and it is asserted that 45,000 tons have, up to the end of 1858, been exported. In the beginning of the last-named year there were some 50 vessels at anchor off the islands, of a total freight of probably 45,000 tons. In September, 1857, I saw at Aden 27 vessels destined for the Curia Murias, and freight to the extent of 80,000 in all has probably visited them within the past three years. A man-of-war has generally been in attendance as a survey or guard-ship, and probably not less than a quarter of a million sterling has, within four years, been expended on this adventure.

The officers of the Indian navy are conducting an extended and minute survey of the islands, and will doubtless present us with charts, characterised by the minuteness and accuracy which have hitherto distinguished the labours of that body. Captain Pullen, of

H.M.S. *Cyclops*, has given us a set of deep-sea soundings made for telegraph purposes of the greatest interest; and what is now required is an examination of the group, not only with the view of describing their physical characteristics, but more especially with the object of setting at rest the question as to their guano-producing capabilities.

Arrian* is the first author by whom the Curia Murias are mentioned under the designation of the islands of Leuobins. Idrisi speaks of them under the name of Khartan Martan. A Venetian officer, who accompanied the expedition of Soliman Pasha against the Portuguese of Diu in 1540, visited them, with the ships, in quest of water. He merely speaks of them as barren, and thinly inhabited. From this period to the date of the survey in 1834-35 they are scarcely noticed anywhere.

The group, situated between the 56th and 57th meridians, and 17th and 18th parallels, consists of five islands, stretching over an elliptical patch of sea 8 miles by 20, whose larger axis is from east to west, approaching within 20 miles of the Arabian coast—1. Heláníyah; 2. Rodondo; 3. Sodáh; 4. Jebeliyah; 5. Hasiki; the most remote being less than 35 miles. They are situated in a large bay from Ras Nas to Ras Sheshedat, some 70 miles across, and from Heláníyah, which is just on the chord, 35 miles in depth.

1st. *Heláníyah* is $7\frac{1}{2}$ miles in length, $4\frac{1}{2}$ in breadth, and nearly 20 nautical miles in circumference. On the north-eastern side of the islands is a large bay called Ghulbat or Rohib; measured from the great bluff where it begins, it is $3\frac{1}{2}$ miles in a straight line across, and $1\frac{1}{2}$ mile deep, its area being about 18 square miles. The island is remarkable for its perfect sterility and the ruggedness and irregularity of its outline. The centre of the island rises into a group of sharp peaks or spires, one of which attains the elevation of 1510 feet; from these spurs and ridges run out in all directions, lesser hills filling up the intervals. The steep precipitous points of the island along shore and through the interior are covered with coarse gravel and sand. On the eastern extremity of the island the contour of the hills suddenly alters to a bold and precipitous headland of 1645 feet in altitude, pushing out into the sea; its position, as given by Captain Haines, is $17^{\circ} 32' 43''$ N., $56^{\circ} 7' 17''$ E., and consisting of tertiary limestone, the rest of the island being granite, hornblende, rock, or porphyry.

* See Paper by Dr. Hulton, surgeon in 1835 on board the survey ship, Reports of Geographical Society, Bombay, 1836, p. 183; also Captain Haines' Survey Report, Transactions of the Royal Geographical Society of London, vol. xv., 1845, p. 131; and Bombay Geographical Transactions, 1854, vol. xi.

2. *Gurzauf*, *Agarezauft*, or *Rodondo*, the last being the name by which it is usually known among European navigators, is a small rocky island about two miles in circumference, about six miles to the north of *Helániyah*. It consists of a mass of four rocks at the base all grouped together; then of two conical peaks of unequal size, the higher attaining an elevation of about 200 feet above the level of the sea. There is a small rocky island about 300 yards to the westward of *Rodondo*, and another about half this distance to the north-west, with channels of from 8 to 13 fathoms between.

3. *Sodih*, six miles to the westward of *Helániyah*, stands next to it in point of size. It is about three miles in length by two in breadth. It forms an oblong concave in its longer side, with a fine bay 1500 yards deep,* the entrance being about 900 across. It consists of a group of rugged, barren, independent hills, rising in a vast shapeless mass near the centre to the altitude of 1310 feet; gravel and sand abounding all along the sea-shore and in the harbours in the interior.

4. *Jurzat*, *Kibbiyah*, or *Jebeliyah*, the easternmost of the group, is somewhat oval, and 3 miles in the longer by 2 in the shorter diameter. It consists, like the rest, of a collection of detached hills more rounded and less pointed than the others, the highest of them attaining an altitude of 560 feet. There are a number of small peaked islands immediately around the shore, with multitudes of sunken rocks rising just above the surge.

5. *Hasiki*, the westernmost of the group, is $3\frac{1}{2}$ miles long by $\frac{1}{2}$ broad, lat. $17^{\circ} 27' 16''$, long. $55^{\circ} 40' 49''$. It attains an elevation of about 500 feet, and has a sunken rock to the westward of 150 yards in length.

Captain Haines and Dr. Hulton, neither claiming to be professed geologists, though both excellent observers, are the only authorities we have as to the geology of these islands; but the valuable papers of Dr. Carter on the southern coast of Arabia afford us much collateral light. The *Curia Murias*, with the exception of the great bluff of the *Helániyah* group, consist entirely of plutonic rocks, granite, syenite, porphyry, and hornblende rock:†—

* Haines, Transactions of Royal Geographical Society of London, 1845, p. 130; and Bombay Geographical Transactions, 1854. How much it is to be regretted that the papers of Captain Haines and Dr. Hulton were not examined when the guano adventures first began in 1856! The sailing directions of Captain Haines are so valuable that a reprint of them ought to accompany any new survey.

† I give hornblende-rock on my own authority; Dr. Hulton calls it greenstone, but his description corresponds much more closely with what I have designated it than what he assumes it to be. The structure of the *Curia Murias* seems closely to resemble that of the granite and hornblende rocks at Vingorla. Dr. Carter

"As we approach the centre of Curia Muria Bay on the mainland" (says Dr. Carter), "a totally different aspect presents itself. Here we observe Ras Shuamiyah, which is about 135 miles from Ras Jazirah, another and much more extensive outbreak of igneous rocks than at the latter point. The former cape consists of a dark-looking mass of igneous rocks, and on either side of it black dykes irregularly extend up through the white strata, in some places raising them and running along between them, in others attaining the summits and flowing along the surface of the cliff, the uniformity of which has been destroyed by the eruption. In some parts it is raised higher than we have hitherto seen it, in others it is more depressed; a few miles south-west the irregularities still increasing, bring us to a stupendous mass 4000 feet above the level of the sea. Proceeding onwards south-westerly we come to the promontory called *Ras Nus*, which terminates Curia Muria Bay—a mass of granite rising 1200 feet above the level of the sea."

Dr. Carter's account of the mainland, here slightly abridged, corresponds exactly with that of Dr. Hulton of the Curia Muria rocks. With the exception of the limestone bluff at its northern extremity, Helániyah consists of a mass of granite penetrated in all directions, and occasionally surmounted, by a dark-coloured rock, which he describes as allied to greenstone, and which, as already stated, I have assumed to be hornblende rock. It occasionally puts on the form of veins or dykes, varying from a few inches to 18 or 20 feet in thickness. Hornblende is described as the prevailing material of which they are composed, mixed to a greater or less degree with felspar—sometimes in a disseminated form, sometimes secreted in crystals forming porphyry. The structure again seems occasionally so to alter that the material of the veins is transformed into something like granite, into which rock it ultimately seems to merge.* The formations throughout the group seem almost perfectly identical, differing merely, and that to a small extent, in the mineralogical character and contour of the rock; the granite presenting lesser or larger crystals or more or less hornblende in one place than another, the dark rocks varying in like manner, neither in any way changing in any of the essentials of their character. The island of Helániyah, where it attains the elevation of 1645 feet above the sea, consists of tertiary limestone, abundant in fossils, of what description is not mentioned by Dr. Hulton; it is shown by Dr. Carter to be

considers that the rock described by Dr. Hulton is eupotide, which he holds as synonymous with serpentine. 'Geology of Western India,' pp. 569 and 583. Dr. Carter's 'Southern Arabia.'—'Bombay Asiatic Transactions, 1851.'—'Geographical Papers of Western India, 1856.'

* Hulton, slightly abridged. "I am satisfied that more careful examination would show that though the structure of the veins may change its character so as to become closely allied to granite, the veins themselves actually retain their uniformity."—Letter of Mr. Dawson, late Principal Resident and Superintendent for the Lessees.

the same formation as the nummulite capping the igneous rocks on the mainland to the north. There is no trace of alluvium or altered or travelled material on any of the islands, but masses of sand and gravel, the debris of the adjoining rocks, are found in the hollows and valleys in the interior and forming a band along the sea-shore.

So violent is the surge at times that the spray seems to drift far into the interior of the islands, and pools of salt-water are frequently found from 400 to 500 feet above the level of the sea. To this circumstance seems due the abundance of earthy gypsum found among the guano, and which not unfrequently forms the bulk of the substance so called. Wherever salt-water dries up in contact with earthy matter containing lime, the hasty decomposition ensues, and the sulphates in the salt-water transform the carbonate into sulphate of lime. Extensive beds of gypsum, originating probably in the same way, are said to prevail below the guano.

Water is tolerably abundant on these two lesser islands, but it is nearly all brackish. There is one excellently built wall within 400 yards of the shore on the north-eastern part of Heláníyah.

The flora of the islands, so far as hitherto dated, consists of a few stunted bushes of camel-thorn, some saliferous shrubs, with a few mangroves within tide-mark and the more sheltered little coves.

The fauna of the Curia Murias is, as may be supposed, as circumscribed as their flora. Rats are in profusion, and their existence is ascribed to the wreck of a vessel. Heláníyah is said to mean "Kid or Sheep Island,"* and here goats are found. Wild cats are sometimes seen among the rocks. Of reptiles, the only ones made mention of are the whip-snake and scorpion. Centipedes are plentiful.†

The climate of the Curia Murias, situated a couple of degrees to the southward of Bombay, is singular, and, considering their position, anomalous and inexplicable, but for the high lands in their vicinity. Immediately to the northward and north-westward of the shores of Curia Muria Bay is a vast mass of table-land and mountains extending through Hadramaut to the confines of Yemen, a distance of close on 1000 miles, of a general altitude of from 3000 to 6000 feet. Facing this is, from Ras Morbat to Ras Nus, a precipitous limestone wall of Subhán, varying in elevation from 3000 to 5000 feet; and over these

* Note to Haines' paper, Transactions of Royal Geographical Society, p. 138. Haines and Hulton's, *ut sup.*

† Slightly abridged from Captain Haines' Report, Transactions of the Royal Geographical Society, pp. 127, 149.

elevated masses furious blasts blow down on the Curia Murias. The wind is called *belat* or *balat* by the natives, by whom it is much dreaded. It gives scarcely any warning of its approach, and frequently reduces the thermometer to 50° . In June, July, and August, the south-west monsoon blows with fury, and between December, 1835, and March, 1836, equally severe gales were experienced by Captain Haines, some of them of great violence. In February and March heavy gales from the south-west are frequent, prevailing at times for five or six days on end. In May, 1503, the Portuguese commander was separated from his fleet and wrecked on the islands, and from the remains found by our surveyors like mischances must have been frequent. On the 19th December, 1834, the *Reliance* whaler was wrecked, and the greater frequency with which vessels visit these parts than formerly makes us aware that this is one of the stormiest portions of the Arabian Sea. We have but little information as to the falls of rain in the Curia Murias; they seem infrequent, but violent when they occur, while the utter sterility of the land causes the great bulk of what falls to run off at once into the sea. Dr. Hulton mentions that the setting in of the north-west monsoon is occasionally attended with showers. In want of specific observations, the amount of stones and gravel found amongst the guano, and the almost total absence of all soluble matter, unless where the manure is sheltered by caves or overhanging rocks, fully bear out the assumption I have started with.*

The temperature of Curia Muria Bay is singularly low for that latitude. During the south west monsoon, at the period of the summer solstice, it seldom exceeds 80° . At Bombay, two degrees farther north, it often rises above 90° . In winter it sometimes sinks to 50° , a cold unknown on the seaboard of India. In 1853, H.M.S. *Juno* was nearly dismasted in the violent hurricanes off the Curia Murias, and in consequence of the tempestuousness of these seas during the south-west monsoon the magnificent steamers of the Peninsular and Oriental Company found themselves compelled to abandon the north-western passage, even when it promised a more rapid transit in June, July, and August than the southern détour compelled to be taken. In the middle of April, 1855, the war steamer *Queen* was nearly lost; the Peninsular and Oriental Company's ship *Malta* suffered much during a violent gale south of Curia Muria Bay; and it is stated that, within seven months, we

* A single fall of rain, such as visited the still more rainless pinnacles of Aden in December, 1842, 15th July, 1848, 21st August, 1849, 28th October, 1852, in September, 1853, and March, 1854, or April, 1859, would have swept away the soluble elements which give guano all its commercial value, and de-
bopes of the gatherers for years to come.

had had two distinct and well-pronounced cyclones developing themselves in the Arabian Sea between the 54th and 56th meridians, and which scarcely seem to have extended over twelve square degrees in all. From the ir retrievable barrenness of the Curia Murias, the scarcity both of animal and vegetable life, we are quite prepared to find them almost destitute of inhabitants; but they never seem to have been wholly unpeopled since first mentioned in history. The following is the account given of them by Dr. Hulton* :—

"Among the people on the southern coast of Arabia, they are usually spoken of as the Juzan of Ghulfan: called so from an enterprising family belonging to the great Mahara tribe. The head of this family, Said bin Oomar bin Haat bin Ghulfan, possessed a small property in the neighbourhood of Morbat, called Howceys. Being of an active commercial turn he amassed considerable wealth, and, having drawn together a numerous party of adherents, he made a vigorous attempt to possess himself of the government of Morbat. In this, however, he failed, and was compelled to seek refuge in the island of Heláníyah. When affairs had become more settled, he returned to Howceys, reserving to himself and heirs the right of possession in all the islands. His two sons and nephews, regarding the islands as hereditary property, still visit them occasionally for the purpose of collecting any money the natives may have received for watering foreign vessels and bugalabs. These visits are always hailed with pleasure by their poor subjects, as they seldom fail to supply them with a few dates and other necessaries.

"Heláníyah is the only island in the group which is now inhabited. Its present population consists of twenty-three individuals, who differ nothing in form and complexion from the Arab. They are perhaps somewhat degenerated from their forefathers in strength and bodily vigour, but this may be explained by their extreme poverty and wretched mode of living. The soil of the island is quite incapable of being cultivated in any part, whatever industry or care might be bestowed in the attempt. There is, indeed, barely sufficient vegetation for the support of a few straggling wild goats, which the sterility of the plains and growing neglect of their former possessors have driven to the hills and valleys. Necessity has compelled the inhabitants to look to the sea alone for means of subsistence: in fact, they may be classed with perfect propriety as ichthyophagi; but in any one previously acquainted with their mode of existence, the comparatively healthy aspect of these islanders cannot but excite a certain degree of astonishment."

The enormous flocks of birds, and the amount of excrement which both the Curia Murias and Salt Rocks off the easternmost point of Africa afford, as observed in 1834-35, are mentioned both by Captain Haines and Dr. Hulton. Guano from sea-fowl was not then known as a marketable commodity; had it been otherwise, probably these gentlemen would have surmised that that seen by them was neither of quantity nor quality sufficient to meet charges. In 1845, Mr. Waghorn despatched a light vessel from Suez to examine the various islands in the Red Sea. In 1846, the ship *Northumberland*, having carried out cargo to Aden, crossed over to Salt Rocks, where the display of birds and gossip excited by Mr.

* See Hulton, p. 184 and 185 of *Geographical Transactions*, Bombay, vol. iii.

Waghorn's adventure led to the belief that guano must abound, and the ship was accordingly loaded with a brownish-looking powder, supposed to be dried excrement.

Salt Rocks, like Socotra, consist of granite, and it is possible the powder was of a kind similar to that brought as guano by the native boat, in 1856, from the Curia Murias.

H. M. S. *Juno*, Captain Freemantle, was, in February, 1854, despatched from England to investigate the matter, and the following July the islands were ceded to the British Government by the Imaum of Muscat. In 1856, Mr. Ord "fitted out an expedition and proceeded to the Curia Murias." They were met by a horde of armed Arabs, who denied the Imaum's right to cede the islands and threatened to shoot the invaders if they did not instantly retire. Mr. Ord once more applied to Government, and H. M.'s Steamer *Cordelia* was despatched, on the 6th June, 1857, to protect the guano seekers against the Arabs; on arriving, on the 14th of September, at the Curia Murias, the *Cordelia* found no opposing Arabs. The *Cordelia* visited Bombay in November in quest of provisions, returning again to the Curia Murias.

The CHAIRMAN expressed his obligation to Dr. Buist for having dispelled their ignorance with respect to the supposed occurrence of large masses of guano in the tract under consideration. But still even there phosphatic substances might be found which would prove to be of some value to our agriculturists. For instance, there had been recently discovered in the Anguilla islets, in the West Indies, deposits of this nature. An American vessel got becalmed off a rock called Sombrero, north of St. Kitt's and the Anguilla isles, and there the captain found a deposit of fossil bones and guano. Specimens having been carried to New York, were analysed and found to be worth from 4*l.* to 6*l.* 10*s.* per ton, and since then this little rock had been stripped of its deposit to the value of 200,000*l.* sterling. Sir Hercules Robinson, the late governor of St. Kitt's, having heard of this adventure, had sent home specimens of a similar deposit on our own Anguilla islands, which had been submitted to Sir Roderick's examination, and he had no hesitation in saying that the substance might prove to be of value to the agriculturist. He had recommended to Her Majesty's Government that a geologist should be sent to these islets, to discover whether some of them may not be as valuable as the rock of Sombrero.

MR. J. CRAWFURD, F.R.G.S., observed that it was utterly impossible that good guano could exist on the Curia Muria islands, lying within the south-west monsoon, and where, consequently, there were torrents of rain. Guano existed only in certain latitudes on the western coast of America, where no rain ever fell, and there necessarily only on uninhabited islands. The Chairman had said that the island of St. Kitt's might give us a substance equal in value to guano; the price showed clearly enough that that was not the case.

The CHAIRMAN.—6*l.* 10*s.*

MR. CRAWFURD.—3*l.* 10*s.* was the average price; but even 6*l.* 10*s.* would not be half the value of good Peruvian guano, which in this country was 15*l.*

Sixth Meeting, Monday, February 13th, 1860.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*The Revs. T. Butler, and C. S. Allen Dickenson; Consul J. Petherick; Colonels J. F. D. Crichton-Stuart, M.P., and J. F. Bateman; R. H. O'Dalyell; and R. H. W. Dunlop, Esqrs., were presented upon their election.*

ELECTIONS.—*Captain J. F. Cooper (7th Royal Fusiliers); Commander H. Carr Glynn, R.N.; and David Aitchison; John Ball; G. Wingrove Cooke; David A. Freeman; Nicholas P. Leader; John Rutherford; Henry Wynn Seymour Smith; and John Ingram Travers, Esqrs., were elected Fellows.*

AUDITORS.—*Thomas H. Brooking and E. Osborne Smith, Esqrs., on the part of the Council; and the Rev. Dr. Worthington and Thomas Lee, Esq., on the part of the Society, were elected Auditors for the year.*

The Paper read was—

China; Notes of a Cruise in the Gulf of Pe-che-li and Leo-tung in 1859.

By MR. MICKIE.

Communicated by H. HAMILTON LINDSAY, Esq., F.R.G.S.

SHANG-TUNG and Leo-tung lie on opposite sides of the Gulf of Pe-che-li. They are mountainous provinces, similar in character, though separated by a tract of alluvial plain. Their opposite shores are connected, across the gulf that lies between them, by the chain of the Miatao islands.

In April and May, at the close of the dry season, the soil appeared arid in the extreme; every breeze raised a storm of dust; but the rains of June and July filled the watercourses and brought out the verdure. The hills are bare of trees; they are stripped for firewood. Part of their sides are terraced for cultivation, and sown with Indian corn and millet.

The climate during spring and summer, is undoubtedly good; there is no malaria, and the air is dry and pure. The cold in winter is described as intense. Every man at Che-fow has a fireplace under his bed. The buildings differ from those of South China, being small, substantial, and plain. They are built of stone or brick, and rarely of wood. The people are simple in their habits; they are a hardy race, tall and robust, and live long. The poorer people live on Indian corn, the others on wheaten bread, and, in winter, all of them consume much animal food. The population lives by agriculture, fishing, and carrying produce. Each donkey or mule

carries but a small load over the hills, and a driver is required for every two animals.

In winter the whole population lies nearly dormant.

Che-fow is the general depôt of trade in the Gulf. The principal imports are English and American piece-goods, opium, sugar, and Chinese paper from Ningpo. Alum and Shanghai cotton are also imported to a small extent, together with sundry other Chinese cargo. The great exports are bean-cake, peas, and pea-oil. Trade opens in March, when the ice breaks up, and closes in October. Coal is a regular article of local trade. It is found at several places along the coast, but is soft and dirty, and dearer than foreign coal would be.

SIR R. MURCHISON, in returning thanks to Mr. Mickie for his communication, said it was highly creditable to one of our leading merchants to employ such an excellent observer as that gentleman. Formerly it was too much the practice among English merchants to keep good things to themselves, but now they seemed to have a satisfaction in communicating all the information they obtained, whereby commerce might be extended. He was happy to see sitting near him his friend Mr. Hamilton Lindsay, the gentleman who had engaged Mr. Mickie to visit these countries, and who having some personal acquaintance with the country would, he hoped, address the meeting.

MR. HAMILTON LINDSAY, F.R.G.S., said he felt a peculiar interest in this contribution of Mr. Mickie, because some twenty-eight years ago, in 1832, it was his lot to add in some small degree to our geographical knowledge of a country immediately adjoining those which had been visited by Mr. Mickie. In 1832, under the auspices of Mr. Charles Marjoribanks, then the head of the Company's factory in China, he made a voyage along the coast of China, and visited in his course the ports of Amoy, Foochow, Ningpo, Shanghai, thence round the promontory of Shantung to the port of Wei-hae Wei; from there he struck off as far north as he could to the promontory of Corea. There, in a perfectly new tract of country, he fell in with a magnificent harbour, which he named after his friend Mr. Marjoribanks, and also made some discoveries which the Geographical Society honoured him by calling an Island after his name. He thought a great deal of credit was due to Mr. Mickie. He went in charge of a purely commercial speculation, to see what could be done in carrying out commercial operations with the Chinese, and had it not been for our operations at the mouth of the Peiho at that time, he might have acquired more extended information. Sufficient, however, had been gained to prove the probability of important commercial relations with that part of the world.

SIR JOHN DAVIS, F.R.G.S., observed that the interesting paper just read bore testimony to the extraordinary propensity of the Chinese to spread themselves by colonization. Du Halde, who wrote about a century and a half ago, gave this as a reason for inserting the Tartar and not the Chinese names, in a map of Manchouria, constructed by the Jesuits—"Of what use would it be to a traveller in Manchouria to know that the river *Saghalien* (the Amoor) is called by the Chinese *Hèloong Keang*, or River of the Black Dragon, since he has no business with them, and the Tartars, with whom he has to deal, know nothing of this name?" Now Huc, in his late work on Tartary and Thibet, remarks that at present the tables are completely turned, and the Chinese have nearly displaced the Manchous in their original country, from the north-east of the Great Wall to the Amoor. "It is just," he observes, "as if one was travelling in a province of China." The paper of this evening

talked of Chinese ports, and a Chinese population, on the shores of the Pecheli Gulf; and, if we were ever to trade with the new port of *Niu-Chwang*, under our treaty, it was well that the population was Chinese, and not Tartar, for we should have little enough trade with Tartars. The same tendency to spread themselves, so strongly displayed on the north of their empire, has adhered to the Chinese far away to the south; and Mr. Crawford would bear witness to the numbers and wealth of the Chinese colonists throughout the whole of the Malayan Archipelago, from Java up to Singapore. Even in those newest of countries, California and Australia, the astonishing influx of Chinese had excited the jealousies of our own countrymen and of the Americans.

MR. LAURENCE OLIPHANT, F.R.G.S., said that when he was in China, he had the good fortune to make the acquaintance of Mr. Mickie. There were one or two points in his paper which deserved attention. One was the great availability of the port of Chefow, situated a little to the eastward of Tungchow, on the point of the Shantung Peninsula. When at Tientsin the desirability of the different ports was brought under the consideration of Lord Elgin, but the merits of Chefow were not then altogether known. The importance of that port had arisen from the fact of the rice trade having taken that direction since the blocking up of the Grand Canal. It would be desirable, in any new arrangement with the Chinese government, to provide for a trade at Chefow. We might give up our right to trade at Tungchow, for there was very little trade there, and the harbour was four miles distant. Another point in Mr. Mickie's paper, which was peculiarly interesting at the present time, was the account which he gave of the resources of the neighbouring country. He described large flocks of goats on the hill-sides of Tungchow. Mr. Oliphant then discussed the question of a military advance upon Peking in connexion with these resources, and expressed his belief that the Chinese would have no objection to sell to an enemy, if he had the slightest chance of getting anything by it. With respect to the port of Nu-chung, it was rather of political than commercial importance. The recent arrangements with the Russian Government brought the Russian frontier comparatively close down upon the north part of the Gulf of Leotung, and therefore it was very desirable that we should have a political agent in that part.

CAPTAIN SIR F. NICOLSON, R.N., F.R.G.S., in corroboration of Mr. Oliphant's remarks respecting the supplies to be obtained in that part of the world, said, in the first Chinese war, a party from H.M.S. *Blonde* secured seventy bullocks one afternoon, on the shore of the Gulf of Leotung. He merely stated this, as doubts had been thrown on the capabilities of the country to supply a large number of troops.

MR. W. LOCKHART, F.R.G.S., thought it would be desirable to point out on the map the places of the most consequence mentioned in the paper. He accordingly proceeded to do so, and, with regard to Tungchow and Niu-Chwang, observed that they were the most northerly consular ports opened to us under Lord Elgin's treaty. The promontory of Shantung is very mountainous, and is the terminal point of one of the spurs of the Himalayan mountains which crosses China from the upper part of Thibet; there are several breaks in this mountain-chain to allow the Yellow River to pass through, in different portions of its course across the country. This being a mountainous country, the inhabitants of Shantung are a large race of men; the tallest and largest in the empire of China. Chefow is a more important port, as Mr. Oliphant had just stated, than Tungchow, where the water was so shallow that no vessels could approach it. Tungchow and Chefow are the ports for the natives' exports of oil and the beans from which the oil is made, as well as the bean-cake which remains after the expression of the oil; this is used largely all over China for manuring the fields. Large quantities of this bean-oil are produced in the north of China, and it is extensively used both for cooking and for lamps, and

is a most important article of trade. There has been a discussion of late regarding the name of the river Peiho. Some say it means the North River. It is not the North River: the Peiho is the White River in the same manner that the Hwang-ho is the Yellow River. It has been well ascertained that the Yellow River now discharges its waters through a new channel into the Gulf of Pe-che-li, but the exact position of its new exit has not been found. The coast of Tartary is of importance, because in the deep bay, on the southern portion of the Gulf of Tartary, is a large gold-digging district. When Commodore Elliott was anchored in this bay, some of the sailors obtained gold from the natives, who were very ready to give a nugget of gold for an empty beer-bottle. From Shen-se, and from the region of the country on the western side of Shen-se, as well as from the province of Yun-nan, a great quantity of gold also came. He thought it desirable to point out these places on the map in the Gulf of Leotung and the Gulf of Tartary, as they would in future be the chief points of our trade in the extreme north of China; and the new consular ports in this great gulf would probably be the future markets for much of our manufactures. He concluded by saying a few words respecting Hankow, on the Yang-tse-Kiang, as the place of largest trade in China, and as the spot whence we shall obtain the most ready access to the interior of the country.

CAPTAIN SHERARD OSBORN, R.N., F.R.G.S., congratulated the Society upon receiving this additional crumb to the small amount of real information which we possessed of that great empire. It was extraordinary how small was the amount of information which we could put into the hands of Admiral Hope to assist him in the navigation of the waters of Northern China. The moment our fleet left the Yang-tse-Kiang it would steer along on an almost unknown coast. Mr. Mickie's paper was doubly important because it treated of the Shangtung promontory, which, in pending war with China, would be the basis of our operations against Peking. It was a mountainous district, and, beyond that, we knew little about it. Our knowledge was simply confined to the seaboard; and Mr. Mickie's notes confirmed what he had been able to send home about two years ago. He was not quite confident about the safety of this port of Chefoo as an anchorage; for, in 1858, a French frigate anchored in the bay under the impression that it was a good harbour: a gale of wind came on, and this vessel was very nearly lost. The climate of Shangtung, in the spring, reminded one amazingly of that of England, or the southern portions of the Crimea. The vegetable productions of that part of the province were famous all over China as being very fine. He did not remember being struck with the gigantic appearance of the inhabitants, alluded to by Mr. Lockhart: they were fine, able-bodied, and healthy-looking men. Of the province of Pecheli, beyond the banks of the Peiho, we know still less; but it was as well to state that in Pecheli alone, of all the provinces in China, he had been struck with the general appearance of starvation of the masses. The more he (Capt. Osborn) had investigated the subject, the more convinced he was of the fact, that the province of Pecheli did not produce enough food to support its population; at the same time, after what we knew of victualling an army in the Crimea, where there were no resources, he saw no reason for believing we could not do as much in Pecheli; and if food and corn were scarce in that province, there was no doubt they were plentiful in Leotung and the Corea—we should merely have to bring the food to the army. A few figures would best prove the vast amount of grain annually required for the support of the province of Pecheli. In times of peace the grain imported into Tientsin for the capital amounted to 430,000 tons, of which 350,000 tons went direct to the capital. In 1854, during the worst period of the rebellion, the internal communications being interrupted, great efforts were made for the first time to carry this grain coastwise to Peking; and, in a first experiment, he found that they succeeded in conveying 100,000 tons by sea to Tientsin; and, as a

proof of the wonderful resources of China, he would mention that that 100,000 tons was transported from Tientsin to Tungchow (12 miles from Pekin) in 3892 *river boats*! After a few more remarks upon the grain statistics, he said that, in the opinion of Mr. Lindsay upon the commercial importance of Hankow, he fully and heartily concurred. Having visited that great emporium, situated in the heart of China, and having navigated in a frigate that magnificent stream the Yangtze, which cuts as it were the vast empire of China into two, he might be pardoned for saying that that fine highway for the shipping of England and America seemed as if Providence had expressly created it to enable European energy and European civilization to be brought to bear upon the most populous, the richest, and as yet least known nation of the globe.

DR. MACGOWAN, of the United States, said, he had spent seventeen years in the province of Chihkiang, and he had travelled over the adjacent provinces, so that he had an intimate acquaintance with that part of the country. Although Marco Polo had visited Hangchow, he believed he was the first foreigner who had observed the remarkable phenomenon of the Egge, one of the most striking physical wonders of the world. A person who is there at the period of the autumnal equinox will, especially if there be an easterly wind, witness it in all its grandeur. Imagine an estuary four or five miles in width, the tide rising, and at first presenting the appearance of a white line, and gradually approaching with the noise of thunder, and by degrees rising until it becomes a wall four or five miles across, and 20 feet in height, coming up almost with the velocity of a cannon-ball. The vast amount of craft belonging to that great city—for it is one of the greatest cities in China—are obliged to put out into the stream to meet the egge, because if they remained close inshore they would be crushed: when they meet it they all rise over the advancing wave, and then for a moment they are in great tumult. The egge is spent about ten miles above the provincial city of Hanchow. With reference to the change in the course of the Yellow River, he was the first foreigner to call attention to the fact. He supposed that when in high antiquity that river emptied into the Gulf of Chihli, through a delta, that the "backward flow," alluded to in the *Shuking*, was an egge, and that that tidal action caused the first deflection of the stream into its late course. From some statements found in the same ancient classic, there is reason to believe that other physical changes have taken place in Chihli within the historic period, the most noted being the submergence of a large tract of land. It is inexplicable how such a change as the comparatively sudden shifting of that great stream should have been accompanied with no perceptible increase of the waters natural to that part of the Great Plain. It would seem almost as if the stream had permeated its bottom, finding a subterranean exit to the sea. This conjecture (published three years ago by Dr. Macgowan) has been supported by the testimony of a recent Jesuit traveller. There is evidence, he adds, of a subterranean communication between the continent and the Japanese islands, afforded by earthquakes in that archipelago causing an elevation of the inland waters of China; and it is doubtless through submarine or subfluviate fissures of the adjacent region that the water is derived which is so largely ejected from the volcanoes of Japan. Chinese records mention the temporary disappearance of the Tsien-tang and other streams. There is another singular feature characteristic of the turbid Hwang—its occasional limpidity, being on an average perhaps once in two hundred years perfectly clear for a day or two.

MR. J. CRAWFORD, F.R.G.S., criticised at some length the views of Mr. Oliphant and Captain Sherard Osborn respecting the means of transporting and provisioning an army of 30,000 troops on a march upon Pekin.

Seventh Ordinary Meeting, February 27th, 1860.

THE EARL DE GREY AND RIPON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Commander H. Carr Glyn, R.N.; Colonels Stephen John Hill and J. F. Dudley Crichton Stuart, M.P.; the Rev. T. Silver; and A. Benson Dickson, C. H. C. Plowden, W. W. Seymour Smith, and F. Verbeke, Esqrs., were presented upon their Election.*

ELECTIONS.—*The Rev. J. C. Curry Fussell; Captain Lawrence Heyworth; the Rev. H. J. Ingilby; Major A. Burrowes Kemball, C.B. (H. M.'s Consul General, Bagdad); the Rev. T. W. Prickett; Major Patrick Stewart, Bengal Engineers; the Rev. H. P. Wright; and W. H. D. Archer, G. Parker Bidder (Pres. Inst. Civ. Eng.), Thomas A. Mariette, Daniel Meinertzhagen, G. T. Murray, W. B. Phillimore, D. Brooke Robertson (H. M.'s Consul at Canton), William Howard Russell, LL.D., J. Shaw Stewart, and J. Palmer Stocker, Esqrs., were elected Fellows.*

The Papers read were:—

1. *On South Africa.* By C. J. ANDERSSON, Esq.

On the River Okovango, lat. $17^{\circ} 30'$, long. 19° ,
(approximately), March 26th, 1859.

FOUR days ago, after vast exertions, I struck the river (I am not quite sure the name is correct) from which I now date this hasty scrawl. I have accidentally encountered a party of Mambari *en route* for their homes in the vicinity of the kingdom of Benguela; and although the chances of these lines ever reaching you are very remote, I do not like to let slip the opportunity of addressing you. But it would be useless, under the circumstances, to enter fully into details of my proceedings since I last wrote to you. I write more for those who feel some interest in my poor self than otherwise.

Cunene I have not seen, and probably never shall, though I shall certainly strive hard to accomplish my original object. But this river seems now to afford as much interest (I firmly believe it to be a branch of that prince of rivers, the Zambesi) as the Cunene, for it is of most noble proportions, which you may judge of from the fact of its being no less than 200 to 300 yards broad, apparently of great depth, and with a steady current flowing at the rate of $2\frac{1}{2}$ to 3 miles per hour. But you will probably be surprised to learn that its flow is *eastward* and not westward. What river can then this be in such latitude and longitude? Why, no doubt, the Chobe, or one of its principal branches. Part of its waters of course finds its way to Lake Ngami *viâ* Tioughe, but it seems utterly impossible that all this mighty flow of water should find an outlet solely through

that comparatively small stream. Not having Dr. Livingstone's map by me nor his work, I cannot judge how far that worthy explorer's views and knowledge may agree with my theory. But a strong proof in confirmation of what I here project is the circumstance of the *Makololo*, in a late foray that they made to these parts, having come *in canoes all the way from Sekeletu's town*. I am aware, of course, of the Dzo River, but that does not answer the purpose very well. A very intelligent native drew for me on the ground a rough sketch of the river, in which he makes it divide in the neighbourhood of Libebe—one branch flowing south (the Tioughe) and another to Sekeletu's capital.

Since I struck this river, I have descended it near 40 miles in order to visit the paramount chief of these parts, and have found the average course to be s.s.e. If it continues so, which I have reason to believe it does, then we shall have to move Libebe more westward and perhaps a little southward of its position in former maps. The chief to which I allude rules over a tribe called Ovaquangari, residing along the river for a distance of about one hundred miles—if not more. They are at once a pastoral and an agricultural race, and were lately living in great affluence until that scourge of Central South Africa, the *Makololo*, ravaged the land throughout its entire length and breadth, sweeping away vast herds of cattle, and besides killing many people, carrying off numerous prisoners. Confound the *Makololo*! I devoutly wish Dr. Livingstone was safe back at Sekeletu's, for I believe he possesses great influence with that chief, and may therefore possibly be the means of stopping further bloodshed and desolation. All the fine promises that the *Makololo* made to that noble explorer, and all their protestations and cry for peace, after all, you see, was a mere political farce. It is a thousand pities, since this people already possess more cattle than they know well what to do with. There is not a tribe or nation within several hundred miles of their capital that has not been impoverished by these gentlemen marauders.

The banks of this river are considerably elevated, but slope gradually down to the water's edge. The upper portions are luxuriantly covered with tall handsome forest trees of a dark foliage, prettily set off by vegetation of a lighter and fresher hue near the water, such as vast cornfields, groups of acacias, &c. There is nothing striking or gorgeous in the appearance of the vegetation, but the *tout ensemble* is effective. Only, as far as I have seen, the north side of the river is laid under cultivation. The cereals are of the usual native description. The river abounds in fish, alligators, and hippopotami, and is navigated by canoes.

I have come here quite alone, only accompanied by a single native attendant, but return forthwith to fetch my waggon and men from the desert, distant about 80 or 90 miles. The Ovaquangari appear to be a fine race of men, but I cannot say I have as yet any reason to feel very confident in them. They have much intercourse with the Ovampo, and of course know well our proceedings in that quarter. Not yet knowing the real strength of my party, they are as yet very civil, though a little forward.

Three days' journey *east* of the Ovaquangari, the Ovabundya dwell; they are a somewhat smaller tribe. Beyond them again we find Ozomboi, and still farther east Bavickos and Libebes. Whether the two last-named are identical or two distinct tribes I cannot make out, but am inclined to think they are distinct. I must forbear to say anything at present of the country to the N. and N.W. The Mambari, no doubt (though by the by they don't look very intelligent), could give me some valuable information of these parts; but though there is a man here who can make them understand, I cannot for my life induce the fellow to interpret for me. But one thing seems certain, viz. that they dwell on this very river and a very long way off, say at least twenty days. Further it seems certain that this river has its source very far to the north. If this be so—and the volume of water almost speaks for itself—and that its course is about N.N.W., it then seems to me very evident that the Cunene must flow nearly parallel with the coast for a considerable distance.

Short as the distance may appear to you that I have traversed, I have yet had desperate hard work to accomplish it. My course has been woefully zigzag. For about 300 miles the axe has never been out of our hands. I have usually six expert men at work from day-break till dark, and sometimes I am compelled to throw my whole force on it, and yet such is the denseness of the bush and the forest (from Okamabuti to this point it is one *unbroken forest*) that for days we can only get a few miles. Indeed, more than once have we been three or four days in getting as many miles. I might have had some fine shooting had time permitted, for some parts traversed literally swarmed with elephants, but except when we stood in absolute want of food I never went in pursuit of them. Nevertheless, since I last wrote to you, I have succeeded in securing about twenty noble bulls.

P.S.—It may interest naturalists to know that I have made a considerable collection of insects, chiefly *coleoptera*, somewhere about 10,000 *individuals*. The field, however, is comparatively poor for the entomologist.

Mr. Andersson again writes as follows: "Lat. 17° 46', long. 18°, near the river Okovango, Aug. 1, 1859. . . . For the last four

months I have been almost wholly confined to my bed, and God only knows when the disease will take a favourable turn. It is a fever of the most malignant kind that I am suffering from. The whole of my party have been invalids from the same cause, and some have even died of the effects.

It was my intention to have traced the course of this river northward for some distance, and then to strike out for Benguela. Every preparation was made for the attempt, when, alas! all my plans were frustrated by the whole of my men being laid prostrate by the terrible fever from which I am still suffering. My regret was naturally extreme at being thus unexpectedly compelled to abandon an undertaking which just then seemed to promise every success.

My retreat to Damaraland is at present completely cut off from want of water. There are no natural springs in this country. I must wait at least four months before the rains fall."

A report from Cape Town stated that in consequence of Andersson's forlorn condition, Mr. F. Green intended to start from Damaraland immediately to his assistance, and hoped to reach him by the end of October. Mr. Green expected to be on his way back about the end of December, if not earlier.

SIR GEORGE GREY, F.R.G.S., Governor of the Cape, said he was totally ignorant of that part of the country where Mr. Andersson was, and he did not feel qualified to say much regarding it. The only point in the paper which struck him was the character given of the people of the interior. Now he did not feel certain in his own mind that the Makololo tribes were as bad as Mr. Andersson conceived. That gentleman had heard only the story of one tribe; could he have sat as an impartial judge, and have heard the reasons which induced the Makololo to attack the people in question, he would probably have heard some defence in justification of their conduct. He was himself the more inclined to believe this from the conclusion of Mr. Andersson's letter; for the impression left upon his mind was, that he was very doubtful of the character of the tribe amongst whom Mr. Andersson found himself. From his own knowledge of the connexions of the Makololo, he really believed that they were as good as any African tribe with which we were acquainted. Mr. Andersson was a man of energetic character, devoted to his duty, and receiving no adequate reward for his labours; and it struck him that it would be a graceful act on the part of this Society to convey to Mr. Andersson some expression of sympathy and regret for the state in which he was unfortunately left. To persons at a distance the recognition of their services, and sympathy for their sufferings, produced a much greater effect than those who lived at home could imagine.

The second Paper read was—

2. *On the Congo.* By Captain N. B. BEDINGFELD, R.N., F.R.G.S.

11, Portsea Place, Connaught Square, Jan. 19, 1860.

At a time when such efforts are being made to open out the interior of Africa to the benefits of legal commerce and civilization, it has

occurred to me that the Congo river is well worthy the attention of the Royal Geographical Society.

In the first place, in addition to its being so much nearer England than the Zambesi (within a month by steamer), the dangers of the Cape of Good Hope and the Mozambique Channel are also avoided. *It has no bar*, having 150 fathoms water at its mouth. It is navigable for sea-going ships nearly 100 miles, either under sail or steamer. I myself took H.M.S. *Pluto*, drawing 9 feet, to Embomma and back with very little trouble. H.M.S. *Antelope* and *Medusa* have also ascended as far as Pundo de Lenha, the latter vessel drawing 12 feet, in the month of August, when the river is at its lowest. Should the trade ever be developed, it is within reach of the West African packets, and I also hear a Portuguese line is now established to Loanda, touching the islands of St. Thomas and Prince's; provisions are abundant and cheap; natives friendly; and I believe with very little encouragement they might be induced to cultivate ground-nuts (of which considerable quantities are even now exported), or anything else likely to pay, to a much larger extent than they do at present. They could also collect palm-oil, copper ore, ivory, gum, and beeswax. Cotton grows everywhere as on the east coasts; there is also *lignum vitæ* above the rapids. At Pundo de Lenha, about 30 miles above Shark Point, there are numerous factories, and room for more if the bush were cleared away; vessels here lie in deep water alongside the wharves for loading and unloading; it is tolerably healthy, and a few miles above this point the mangrove ends, and high land commences. The factors here state that the wild cotton, growing in abundance, is of good quality, and easily separated from the seed; it produces two crops a year (I should mention that at Loanda, only 200 miles south of this, cotton is exported, and its cultivation encouraged by the present governor). They also state that the islands in this part of the river, some of them of considerable size, are well suited for its cultivation.

The village of Embomma is situated on a hill, and is admirably adapted for a trading settlement; there are also several factories of the Portuguese; a large market is held here once a week, and it is the central dépôt for slaves. The French have established there factories on a large scale for the emigration scheme at the mouth of the river, opposite Shark Point, and they were to have had a small steamer to ply between Tench Point and Embomma, to bring down the so-called emigrants.

The country round Embomma is the granary for the slave factories along the country and the coast to the north of the river; it

produces corn, farinha, beans, and almost every European vegetable in abundance, and Lieut. J. W. Pike, R.N., saw at one of the Portuguese factories a vine bearing excellent grapes. That gentleman is lately returned from the Congo, and I am indebted to him for much information respecting the present state of the river.

I believe there has been no attempt to explore this river above the rapids since that of Captain Tuckey in 1815; the sickness and mortality in this expedition at first sight seem alarming, and may have been partly the reason why no effort has since been made. A careful perusal of Professor Smith's Journal (who accompanied Captain Tuckey) will, however, show good cause why it should not be so.

The treatment of African fever was at that time little known; blood letting and calomel to salivation seem to have been resorted to. Free use of palm-wine, liberty to run about amongst the swamps, or sleep in the dews at night or in the negro huts, with excesses in another way sure to tell in an African climate, together with over-fatigue, will readily account for the great mortality. I believe the Congo to be as healthy as any other river in Africa, and the peculiar dryness of the atmosphere, mentioned by Professor Smith, would make it likely to be more so.

This expedition seems to have arrived in the river at the very worst time for exploring, viz. when it was at its very lowest, and they were consequently obliged to travel by land, and endure much more fatigue than would otherwise have been the case. At that time they estimated the largest rapid, that of Yallata, to be a fall of 30 feet in 300 yards; 17 days later the river had risen 7 feet, with no perceptible difference in the current; the rise in the wet season seems to be in the narrows between 12 and 15 feet, but at Ponto de Lenha it is only 5 or 6 feet.

We are led to believe that the Congo flows through a very rich country capable of the highest cultivation, with abundance of water independent of the river itself. Professor Smith thus speaks of it at the point at which they were obliged to turn back owing to the sickness of their party: "We are at the beginning of a country evidently capable of extensive cultivation, with a fine navigable river, abundance of provisions for sale, and an increased population." Captain Tuckey, also speaking of the river a little lower down, but above the rapids, says—"It is a magnificent river, three miles wide, with the most beautiful scenery equal to anything on the banks of the Thames."

The Zambesi, for many reasons, will never prove a good outlet for the produce of the interior, for it is not navigable for sea-going

ships, and it is, I fear, a fact that the Portuguese will throw great difficulties in the way of trade ; at present they do not allow foreign merchants to go above Quillimane, and the duties there are enormous. We should therefore, I think, look for another river open to free-trade, and such the Congo offers to us. The immense body of water flowing from it all the year round, the rich tract of country through which it must pass, the probability that it would lead us near some of the long-disputed snow-capped mountains, and the little information we have of that part of Africa, make it I conceive worthy the consideration of the Society, if an expedition could not be sent out at small expense to ascertain, in the first place, if the river is navigable for 600 miles above the rapids, as reported by the slave-traders, and if so, whether an easy path could not be found from Embomma to a spot above the rapids, mentioned by Captain Tuckey as admirably adapted as a station for the further exploration of the river.

I firmly believe this could be done, and also that canoes of a certain construction might, without much difficulty, be taken above the rapids for the purpose.

Commanders Hunt and Moresby ascended the river in their boats as far as the first rapid in January, 1857. They had not much difficulty, for although they estimated the distance to be 130 miles, they were only six days going and returning ; they describe the weather as so delightfully cool that they could dispense with awnings in the day-time. They had no sickness whatever.

Should an expedition be sent out, it would of course require mature consideration as to the best plan of proceeding. I should propose a small schooner yacht that would carry out, in addition to provisions and presents necessary, a small cargo for the purpose of trade, as you would thereby encourage the natives, and at the same time by bringing home a return cargo considerably lessen the expense of the expedition. Two canoes in sections (of the same material as our steam-launch in the Zambesi was constructed) should be sent in her ; each section light enough for four men to carry overland at parts of the river it might be found dangerous to drag them through. Crews for them might be hired ; the Katenda men are excellent boatmen, very similar to our Kroomen ; the pay should be made to depend upon their conduct during the trip. The schooner should not ascend above Embomma, and I apprehend there could be little difficulty in keeping up communication with her, and thus to Fernando Po, and to England by the African packets.

An expedition should arrive in the river about the end of Sep-

tomber, so that there is ample time should it be deemed a subject worthy of consideration.

MR. J. J. MONTEIRO said—I have heard with great pleasure Captain Bedingfeld's proposition for an expedition to the River Congo.

I consider this proposition as a most important one in many respects, and which, if carried out, will be productive of the greatest benefits to Africa and to commerce. It will be the means of obtaining correct and reliable information on questions of the utmost importance, and at present very prominently attracting attention. I allude more particularly to the suppression of the slave trade, and to the magnificent capabilities of the whole of Angola for the production, on any scale, of cotton of the finest quality. That the hot, damp climate of Angola is essentially suited to the cultivation of cotton is evident from its growing luxuriantly on soils and under circumstances of very great variety. I have seen it growing abundantly, though not with equal facility, perhaps, on the stony soil of the mica and quartz rock, and on that of the mica schist and clay slate, from Ambriz to Bembe, as well as on the calcareous tufa and trap rocks of the country traversed by Livingstone, and on which I have travelled as far as the farthest limits of the province of Cambaube, and within a day's journey of Pungo Andongo. In these parts it is produced in great abundance, and the blacks are everywhere seen spinning it, as described by Livingstone. I saw it also growing abundantly on the banks of the River Quanga, down which I returned to the coast from above the important "quitanda" or fair of Dondo. From these circumstances we may be certain that the rich banks of the Congo must also be eminently suitable to the cultivation of cotton.

From my knowledge of the "Mussurongos" and other negroes of that locality, I do not, I am sorry to say, anticipate any commercial advantages soon to result from this expedition; but I do anticipate most important and valuable results from its observations on that hot-bed of the slave trade. This expedition will inform you how the negroes of that country love the slave trade above all others, and how perfectly impossible it is to induce them to cultivate cotton, ground-nuts, or other produce, so long as the traffic in slaves exists, and how impossible it is to abolish this horrid traffic in human flesh and blood without a firm occupation of the principal points on that river and coast, and that then only can commercial enterprise with any safety be established, and civilization or Christianity be introduced amongst the scoundrelly negroes that at present unfortunately occupy that fine coast.

As my contribution towards the realization of this expedition, I beg to offer you a few suggestions, the result of nearly two years' experience at Ambriz and Bembe, a couple of degrees to the south of the Congo. In the first place, the expedition should arrive at the river from the middle to the end of May, and not later, if possible; that is to say, immediately after the rainy season. September, as proposed by Captain Bedingfeld, would be the very worst time to arrive at the coast, the rainy season commencing about October and ending, as I have said, about the middle of May. This is subject, of course, to slight variations, but from May to October may be safely taken as the dry season. Again, in September, all the rivers on that coast are at their lowest level, and the rainy season, then about to commence, is the unhealthiest for Europeans, though the best for the blacks, on account of the terrific heat. The dry season is cool, excessively damp, misty, and comparatively sunless, particularly towards the higher interior country. The rivers in May are, of course, full; and, though the current may be stronger, it is better than having to rot anywhere on the banks of the river, as it is not possible to travel during the rainy season. I do not say it could not be done, as I have myself travelled during the rainy season, and I do not believe one constitution in a hundred

could do it. A very great preservative of health on that coast is to keep constantly moving or at work; any cessation of labour or travelling is soon attended with attacks of fever. Flannel next the skin is considered absolutely necessary on the coast; over it we found a loose dress of blue baize very useful against the dampness and coolness of the dry season.

For ascending the river there is no necessity whatever for a yacht schooner or anything of the kind. On the Coast or at Punto de Lenha, where the Portuguese, English, and American factories are established, a "lancha" or a "palhabote" could easily be hired, and the best possible conveyance to the rapids above. Beyond that, I do not believe anything better for exploring can be employed than the large native canoes.

Not the least opposition to the expedition need be apprehended from the Portuguese slave traders; on the contrary, I think they would be very glad that a party of Englishmen should risk their lives and money to open a road into the interior, and induce the natives to bring down their produce, in the expectation of an increased and cheaper supply of slaves, and because they well know how innocent to their horrid interests are the efforts of Englishmen, who, with a great flourish of representing the power and majesty of England, attempt, single-handed, to put down this detestable traffic on immense coasts, where the natives are the greatest slave-dealers (enabling them, as they say, to be rich without working, and always as drunk as they please), and who call on the weak and powerless authorities to do that which a whole British squadron is unable to effect.

ARCHDEACON MACKENZIE said, of the two communications which had been read, the one relating to the Congo was the more interesting to himself. That river, possessing as it did a better mouth and a better harbour than any other river south of the Equator in Africa, certainly seemed to offer a great opening into the interior. But instead of giving up the Zambesi mission, as the paper recommended, he would suggest another mission to the country of the Congo as well. He did not see how they could interfere with each other, for they would be far apart, there being a distance of two thousand miles across from sea to sea.

MR. CRAWFURD, F.R.G.S., called attention to the improvement which had been effected in the breed of sheep and in the quality of wool produced at the Cape through the exertions of Sir George Grey, and then expressed his concurrence in the views of Captain Bedingfeld respecting the superiority of the Congo over the Zambesi as a commercial route into the interior of Africa. Captain Bedingfeld had seen both rivers, and ought to be a better judge of their respective capabilities than persons at home or those who had seen but one of them. The Zambesi was not really, commercially speaking, a navigable river at all, while the Congo certainly was. What Captain Bedingfeld said about cotton might be set aside, for it was idle to suppose that savages would ever cultivate it so as to render it valuable for commercial purposes. Such had never happened. But there were many things they could produce, and among them was the ground-nut, which produced an excellent oil. Still more important was the palm, from which we obtained the now well-known palm-oil. This oil was more valuable than olive-oil itself, and we imported 20,000 tons of it in 1858, of the value of one and a half million sterling. The cultivation of this palm—the *Elais Guiniensis* of botanists—has done more towards the suppression of slavery than all the navies of France, England, and America put together; for the slave-trade had already actually ceased where the trade in palm-oil was most active. Other reasons why he thought the Congo superior to the Zambesi for the operations of Englishmen were, that the West Coast of Africa was more fertile, and the natives were more civilised than on the east coast, while the distance was not above one half from our own shores.

MR. MACQUEEN, F.R.G.S., shortly observed that the river Okovango, mentioned by Mr. Andersson, is the river named by the Portuguese the Cubango, and is the parent stream of the Chobe, which passes Linyanti to the Leambaye. Mr. Andersson must have struck the Okuvango in about $17^{\circ} 30'$ s. lat. and $15^{\circ} 20'$ e. long., from which point will be, as he says, twenty days' journey north-west to its source in the high lands south-west of Bihe. The watershed between the Atlantic and the Northern Ocean is in about $18^{\circ} 40'$ e. long. The country to the south of the middle Cubango is very woody; and during the wet season a great volume of water runs eastward to the Tioghe, which river communicates with the Cubango or Chobe in Libebe. There is no river in those parts called Embarah. This name is a corruption of the word Aunbere, the name of a chief who resides on the Upper Cubango. With regard to the Congo, it is for a very considerable part of its lower course impracticable for navigation by reason of cataracts and fearful rapids that no vessel could venture to stand. These commence at about 110 geog. miles from its mouth, and over a distance of about 120 miles up the river, which in this instance rushes through a rocky ridge of no great height, everywhere consisting of very barren land. Where Tuckey left the river, in $3^{\circ} 40'$ s. lat., and $15^{\circ} 30'$ e. long., the river was 3 miles broad, $3\frac{1}{2}$ fathoms deep, with a current of 3 miles an hour, on the 4th of September, just at the very time when the river was beginning slowly to swell from the rains, a proof, be it observed, that its extreme source lies at a considerable distance on the northern Torrid Zone, in about $9^{\circ} 30'$ e. lat., and where we find from some authorities it really is, and not far from Nungu. The mighty stream above mentioned is at one place, nearly in the centre of the rapids, confined within 25 yards in breadth, between towering rocks which form its borders. Here it is evident the current must be, as it really is, terrific. How far the river is smooth and navigable above the point where Tuckey left it is doubtful; but it is almost certain that in its more distant parts, towards its source, the stream, like all other African rivers in those parts, runs over rapids and cataracts. Branches of the Upper Congo descend westward and south-westward of the high lands which give birth to the western affluents of the White Nile, especially one large branch flowing near the Equator. An abstract of a remarkable journey, or rather of repeated journeys, by an American gentleman, from the missionary station near the mouth of the Gaboon to a great distance into the interior, has lately come in my way. He explored the country lying between 4° s. lat. and 4° to 6° e. lat., and to a great distance into the interior. It is all very woody, but in many places level plains; and to the north, he says, it is bounded by the range of the Crystal Mountains, a continuation of the very high land extending eastwards from the high peak of the Cameroons. When the full accounts of these journeys arrive, they will be found to be exceedingly interesting. The travels extended over several thousand miles. The river Oggawai, marked on my map of Africa, has a long course from the interior, above 350 miles. It enters the sea at Cape Lopez by several mouths. A French traveller had penetrated above 300 miles into the interior in this quarter of Africa. A French ship had been up the river just mentioned 180 miles. From this quarter of Africa is probably the best course to take to reach the Upper Congo. The interior could be reached by land on the south side of the Congo, and through a fine healthy country; but this for the present may be considered impracticable, because a formidable rebellion has lately broken out against the Portuguese authority at St. Salvador, the capital of the kingdom of Congo. Against this place all the Portuguese forces in Angola, naval and military, were, at the date of the latest accounts, collecting and marching. Till strife is settled, travelling in those parts of Africa will be unsafe and dangerous.

The third Paper read was—

3. *On the Rocky Mountains.* By Captain J. PALLISER, F.R.G.S.

Communicated by the DUKE of NEWCASTLE, F.R.G.S.

THESE papers refer to the proceedings of Captain Palliser's expedition since May, 1859, down to the time of its completion, and to his arrival at Vancouver Island, in the winter of that year.

His party left their winter quarters at Edmonton earlier than would otherwise have been desirable, on account of a great scarcity of provisions. It was not until May 11 that he fell in with buffalo and was able to resupply himself with stores of pemmican.

Owing to Mr. Palliser having been in the Blackfoot country both in the summer of 1858 and in the winter of 1858-9, he was well known and unmolested by the natives. Dr. Hector, also, had acquired great influence among them by his medical skill. The consequence is, as Captain Palliser says, "We have now travelled through the whole of their territories (Blackfeet and Blood Indians), a portion of country hitherto considered so dangerous as to be almost impracticable, and we have neither had a horse stolen nor a gun pointed at us by any of these tribes. However, I do not wish to infer that a total stranger would be equally safe, nor that any one accompanied by a military force (unless that force were a very large one) would also be safe." These Indians lie in very large camps of from 400 to 600 tents.

Captain Palliser was much disappointed with the character of the district lying between the meridian $107^{\circ} 30'$ and 112° , on the south branch of the Saskatchewan: his expectations had been that it would afford a most desirable place for settlers, but he finds it to be ill watered, barren of grass and bare of timber, and it is only in a few places here and there, where the land rises 300 or 400 feet above the plain, that the vegetation improves. The Cyprées Mountains, in lat. $49^{\circ} 38'$, long. 111° , are well watered, timbered, and fairly stocked with game. Here the party encamped and hunted, and from here Dr. Hector was despatched on a branch expedition to re-explore the pass he discovered last year, and to look for a road to the valleys of the Fraser and Thompson Rivers.

As it ultimately proved, this route is not a practicable one. Dr. Hector was entangled in vast forests of extraordinary density, and it was only with the greatest exertions that he even succeeded in forcing himself through it and in avoiding being caught by the winter snows.

Captain Palliser, accompanied by Mr. Sullivan, followed the boun-

dary line, which passed over a level, arid, sandy plain, in which they could rarely procure water except from occasional swamps; while these were brackish and their neighbourhood barren of grass. He then crossed the mountains, and reports that his efforts to find a route practicable for horses, from Edmonton westwards, across the Rocky Mountains as far as the longitude of Fort Colville, and entirely within British territory, have been *perfectly successful*. In addition to this he travelled 50 miles farther until he reached the camp of the United States Boundary Commissioners, in long. $119^{\circ} 30'$.

Mr. Sullivan describes the mountains immediately to the north of the boundary line as capable of being penetrated in many directions, since they do not assume impracticable shapes. The highest of them does not exceed 2000 feet, many do not deserve to be called mountains at all, and their gently sloping sides, with wide valleys between them, seem to offer facilities for roads in many ways.

SIR RODERICK MURCHISON, V.P.R.G.S., said, he held in his hand a letter from Dr. Hector, who, it would be remembered, explored all the most difficult parts of the Rocky Mountains in former years, and who, in the present expedition, was directed by his chief to force his way across the northernmost point of the Rocky chain to Thompson Valley, with the view of connecting the country of the Saskatchewan with British Columbia. Dr. Hector was not defeated in his object by the height of the tracks he had to traverse, but he met with such dense and impenetrable forests that, without a large force to cut down the wood, he found it impossible to get through, and he was consequently obliged to turn southward, and rejoin Captain Palliser at Fort Colville. In his letter he expressed the utmost confidence, when an expedition was sent to ascertain the real source of the Thompson and of the tributaries of the Fraser on the one hand, and of the Great Columbia River on the other, that vast sources of auriferous wealth would be opened out which were now unknown. It was of deep importance to consider what was to become of the population which was about to inhabit British Columbia? That country, though so auriferous, was of such a configuration—the valleys were so narrow, the rivers so rapid, and the mountains so steep—that it was not probable that it could sustain a large population. While this was an objection applicable to the Fraser River district, Dr. Hector spoke of the great breadth of the river courses or eastern tributaries of the Columbia, which he descended, and of the richness of the valley of the Columbia itself.

MR. J. A. ROEBUCK, M.P., said that, looking upon the question as a politician, he viewed with extreme interest all that the geographers told us, because it had long been a dream of his that the English name, race, language, religion, and customs were destined to traverse the continent of America north of the boundary-line between our own and the possessions of the United States. Hearing now that a line of transit had been discovered through the Rocky Mountains, he saw that his dream was likely to be fulfilled, and that there lay before us a great field for British enterprise and colonization. He believed we should live to see the time when the continent will be traversed by a railroad from the Atlantic to the Pacific in British territory. When that day had arrived, what an enormous influence the English name will have acquired! The region north of the boundary-line was as large as the territory which belonged to the United States, and was not only habitable, but really in parts a pleasant and fertile country, with a climate possessing all the soft-

ness of the European climate. The opening up of this country would, in a great degree, counterbalance the power acquired by the United States from the possession of a more southern route. Many years ago, he had endeavoured to make the Panama route a neutral one; but, as it was evident that it would fall into the hands of the United States, it was all the more incumbent upon us to open a route across our own territory, so as to give us free access to both the American and Pacific sides of the continent. This was no more a dream than it would have been one to have told our ancestors in the year 1400 that there would arise a great people on a continent three thousand miles away, who, in the course of a few centuries, would rival the world.

DR. THOMAS HODGKIN, F.R.G.S., rejoiced to hear the sentiments just expressed. A few weeks ago he referred to this route across British North America, and he ventured to say that the contemplated line of railway would be the most important upon the surface of the globe. Certainly, as respects the possessions of this country, there was not a line that could be compared with it. It would not merely be a line of great importance to North America, but it would affect other parts of the world, Asiatic and European as well as American.

The REV. DR. O'MEARA said he should look at the subject as a missionary and a philanthropist. He was much struck with the contrast between the way in which these tribes looked upon each other and the way in which they treated white men who came among them. Those who accompanied Captain Palliser, when they came to the territory of another tribe were afraid to go on. This was quite in accordance with his own experience of these tribes for more than twenty years' residence among them as a missionary. He had known a whole Indian village thrown into confusion by hearing that two or three men of a different tribe had been seen in the neighbourhood. The tribes were at war, and afraid of each other in consequence; but, when a white man came among them, he was received as a friend. The question was, whether our expectations of these poor Indians, who have not yet had the experience that other Indians have had of the white man, would be realised. We knew what had been the result in other cases: that some of the tribes had been altogether blotted out from the face of the earth, and others had been driven far back from their original possessions into a part of the country where they could not get the means of subsistence. He hoped no such fate would befall the Indians who had received Captain Palliser with so much hospitality. It was in our power to prevent it by watching the progress of our explorers and colonists with the eye of a philanthropist, and guarding against the introduction of those evils among them that had been so destructive in other instances. He remembered once telling an Indian chief that he suspected the reason why he opposed the progress of Christianity among his people was because he was fond of fire-water. The chief gave him a look of scorn, and said, "Yes, I love the fire-water; I know it is destroying me and my people, but how came we by the fire-water? Before the white man came among us, we ate fish, deer, beaver, and other animals, and drank the water of our lakes and rivers, and we suffered no harm. The white man came, and told us the fire-water would make us very happy. We drank it, and at last we came to love it. And if you wish us not to make use of it, tell your own people, your traders, not to bring it among us." It occurred to him, then, that something should be done to stay the progress of the evils that had hitherto accompanied the white man in going among the Indians, so that with the progress of our colonization there might be a corresponding progress of our Christianity and our civilization.

DR. J. RAE, F.R.G.S., thought his friend Captain Palliser overrated the danger of travelling through the country. He was at Red River when Lord Southesk, who had accompanied Sir George Simpson to that colony, went off into

the Saskatchewan country with eight or ten men, being satisfied that he was perfectly safe so long as he knew he was accompanied by that number of people. He had the same class of men that Captain Palliser had with him, and only about half the number. Up to the latest information he had performed his expedition with perfect safety and without any unusual danger or difficulty. He knew that the Hudson Bay officers gave Captain Palliser the most efficient men and assistance, and once they had, at a great sacrifice, lent the use of their ablest guide and clerk James M'Kay when his own men mutinied. He alluded to this because there was no allusion made in the paper to any assistance afforded to Captain Palliser. He knew that the very best men in Red River were selected for him. He must also allude to the difficulties which the party met with at Edmonton in getting provisions. It was well known by those who had travelled in America that the buffalo was a migratory animal, and that you could not depend upon always obtaining it. The custom was to collect double the quantity of provisions that was required for their own posts, so that they might have a supply in hand to keep the Indians from starving and to provide for the migrations of buffalo. Now, the difficulty at Edmonton arose from the large party that accompanied Captain Palliser and others who wintered at Edmonton. Sixteen or eighteen persons sat down to mess-table every day; the provisions that had been collected were eaten up, and, as the buffalo had gone away to a great distance, they could not get further supplies for the use of the people at the fort. Dr. Rae proceeded to vindicate the Hudson Bay Company from other imputations which have been publicly made against them, and to explain and defend their policy in dealing with the Indians, showing that self-interest alone, setting aside every other better motive, would induce the Hudson Bay Company to clothe, feed, and supply with every requisite the Indians to enable them to hunt well.

The PRESIDENT could not help congratulating the Society upon the result of this expedition of Captain Palliser. He had already established several points of great geographical and public interest, not the least of them that which was confirmed by the letter from Dr. Hector, showing that in the part of the country near the Columbia river there was a fertile as well as a gold-producing district. This was exceedingly important; for if the utmost advantage was to be derived from the gold-fields, it could only be by the proximity of these fertile plains on the borders of such streams as had been described in the communications read that evening. He trusted it would not be long before we saw Captain Palliser among us, and heard from himself in detail the result of his interesting expedition. He was quite certain, whenever he did come, that he would receive a warm welcome.

PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY
OF LONDON.

SESSION 1859-60.

Eighth Meeting, March 12th, 1860.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*John Ball and James Bright, M.D., Esqrs., were presented upon their Election.*

ELECTIONS.—*Sir John W. H. Anson, Bart. ; Professor Henry Attwell ; the Rev. A. J. Carver, M.A. ; Lieut.-Colonel J. A. Digby ; Lieut. the Hon. F. Fitzmaurice, R.N. ; Captain M. Petrie, R.E. ; the Hon. F. Walpole ; J. E. Anderdon ; C. J. Fox Bunbury ; William Coningham, M.P. ; J. B. Dament ; J. A. Dickenson ; W. H. T. Huskisson ; R. F. Jermyn ; Samuel Kinns, PHIL. DR. ; William Smith, C.E. ; and William Stirling, M.P., Esqrs., were elected Fellows.*

The Papers read were—

1. *South Australia: Exploring Expedition into the Interior of the Continent.* By J. MACDOUGALL STUART.

Communicated from the COLONIAL OFFICE by the DUKE OF NEWCASTLE, F.R.G.S.

SIR R. MACDONNELL reports in his despatch of July, 1859, that Mr. Macdougall Stuart had just returned to Adelaide, having made another very extensive exploratory trip, aided solely by private means. His farthest point appears to have been about lat. 27° S., long. 135° E., a distance of about 90 miles beyond Major Warburton's farthest. The country improved as he proceeded, being formed of alluvial soil, and diversified by numerous small hills, varying from 100 to 150 feet in height, from the summits of which copious springs of clear water overflowed, while there was abundant and excellent pasture in every direction. He describes the dip of the country as being towards the north-west.

The CHAIRMAN said the discoveries were important, and redounded to the honour of the adventurous traveller, Mr. Macdougall Stuart, who had previously discovered an extensive tract of country, and had now extended his explorations still farther in a north-westerly direction. A former Governor of Australia,

Colonel Gawler, whom he was glad to see present, had always maintained that a line of communication might be found, through a well-watered and fertile country, from South Australia to Western Australia. The present discoveries tended in that direction, and seemed, to a certain extent, a confirmation of the views of Colonel Gawler. Sir Richard Macdonnell talked, indeed, of an expedition across the whole continent from Adelaide in a northerly direction; this, he confessed, rather startled him, for the most successful explorer of the interior, Captain Sturt, never arrived beyond a few degrees north, where he was completely beset in a saline and impassable desert. The present exploration, however, tended to the north-west, not towards the great saline interior, and so far it had been very successful.

COLONEL GAWLER, F.R.G.S., said that he could easily conceive that men of the highest science should be led to the conclusion that the whole interior of Australia was a waterless and impassable desert. He had had opportunities of forming an opinion from local observations, and he was gratified to find that they were being borne out by the present discoveries from the head of Spencer Gulf in the direction of the north-west coast. He quite agreed with the President as to the character of the country in a more northerly direction. Much consideration had led him to think that the surface-formation of Australia was something like a great crater; that the high lands all round the coast threw off but short watercourses to the sea, and had a drainage into the interior, forming a great inland sea, of which the wastepipe was, at some previous period, Lake Torrens and Spencer Gulf, by which the whole of the waters, or the greater part, found their way into the ocean. This opening formed the gate, he conceived, by which we must hope to penetrate into the interior, and by which the produce of the country must come down. It was satisfactory to know that in Spencer Gulf there were three good harbours: First, there was Port Augusta at the head of the Gulf; it could hardly be called a harbour, for it was really the head of the Gulf, but there was deep water close up to natural walls of rock, forming a very commodious haven for small vessels. Then, half-way down the western coast, there was what Flinders called "the lagoon seen from the masthead." It was a lake united to the sea by a beautiful little harbour, and when this last discovery was made he (Colonel Gawler) called the lake Lake Flinders, and the harbour Franklin Harbour, after the lamented Sir John Franklin, who was a midshipman at the time on board the ship from which the lagoon was seen. Then, below this, came that magnificent harbour Port Lincoln, in which the whole of the British navy might ride in deep water.

The account sent home by Mr. Stuart of the nature of the country, and of the probability of there being more good country, verified his own conclusions derived from the observation of atmospheric phenomena. His old hut at Adelaide, in which he lived for eighteen months, had a northerly aspect, and he observed, as an invariable effect, that when the wind ranged from north to west the sky was cloudy and the air moist and cool. Again, it was an invariable effect that when the wind ranged from north to east the sky became cloudless, the atmosphere lurid, parched, and dry. So much was he struck by these facts that long before Sturt penetrated into the desert to the east of Lake Torrens, he had marked the spot on the map as the centre of a burning sandy desert. Sturt found it so; his thermometers blew up with the heat, and his pork melted in the bran in which it was packed. This verification of his opinion as to the nature of the country eastward gave him increased confidence in his opinion of the country westward. And here again he was borne out by the report of the Port Lincoln settlers, that they never knew of a hot wind from the northward; and by the testimony of Mr. Eyre, in the very wonderful journey which he made from Spencer Gulf to Western Australia, that there was invariably a cool air and cloudy sky with winds from the north. All these concurrent reports necessarily led to the belief that there was in the

interior of Australia, in a north-westerly direction from Spencer Gulf, a large extent of well-watered country.

With regard to the rounded hillocks which Mr. Stuart discovered, he believed they were of volcanic origin, an offshoot of the great volcanic band which ran through the whole of the Indian Archipelago. Then, as to the existence of gold, he had much confidence that that would turn out to be a solid discovery. There was certainly gold in South Australia, as well as in Victoria. He brought home some specimens in 1841, and, reasoning from analogy, he thought it likely gold would be found stretching across the Australian continent to the Indian Archipelago, just as it had been discovered stretching along the whole length of the American continent. Therefore, he saw every reason to think well of the prospects of that portion of Australia, and he hoped it would not be long before telegraphic communication was established between the south-eastern colonies and the mother country by the line of the north-western coast, Java and Singapore.

The second Paper read was—

2. *Discovery of a New Harbour on the North-East Coast of Australia.*

Communicated by SIR G. F. BOWEN, F.R.G.S., Governor of Queensland, through the DUKE OF NEWCASTLE, F.R.G.S.

A NEW and capacious harbour is stated to have been discovered in the new colony of Queensland, North-Eastern Australia, to the north of the FitzRoy. The party who made the discovery consisted of Captain Sinclair (the master of a little schooner of nine tons), accompanied by one seaman and two passengers. His exploratory cruise was planned mainly in the hope that a reward would be given for the discovery of a secure harbour north of Port Curtis.

Captain Sinclair started from Rockhampton in September, 1859, and followed the shore, anchoring each night and being continually pestered by the natives. On October 14th he had arrived at Glosster Island; the next day he sailed close up to Mount Edgcumbe, and anchored for the night in a sheltered bay. The subsequent night he anchored inside an island, and when the morning broke found, to his astonishment, that the schooner was lying in a fine capacious harbour, sheltered from all winds. Within a cable-length of shore there is from 3 to 4 fathoms; in the middle of the bay, from 7 to 10. There is plenty of fresh water. The harbour is formed partly by islands and partly by sand-banks. One of the islands was between 5 and 6 miles in circumference. Beyond these facts no data of any sort have yet reached this Society. The harbour was named Port Denison.

The CHAIRMAN said he saw present an old friend of his, Mr. J. Beete Jukes, a distinguished geologist and traveller. Mr. Jukes took part in the survey made during some years by one of Her Majesty's ships round the coasts of Australia, and particularly examined the coral islands stretching away from

Cape York to the great Barrier Reef. Though the ship to which he was attached missed this particular port, yet he could give them as much information respecting the physical geography of the coast as any person present. He therefore hoped Mr. Jukes would state what facts he knew, and at the same time communicate some of the knowledge he possessed respecting the formation of these remarkable coral reefs.

MR. J. BEETE JUKES said that he had been on board H.M.S. *Fly*, under the late Captain Blackwood, when the outer edge of a large part of the Barrier Reef, that great coral reef which ran along the north-east coast of Australia, was being surveyed. The survey was conducted by officers specially appointed for that service, marine surveyors, officers of the *Fly*, one of whom, his friend Mr. Evans, was present, and who, he must add, was the very person to whom the accuracy of the survey of the Barrier Reef was chiefly due. Mr. Evans had recalled to his recollection several facts connected with the particular part of the coast in which this harbour occurred, which, perhaps, the meeting would allow him to mention. It was a very interesting spot for a good harbour. There were already one or two harbours in that immediate neighbourhood. One called Port Mole was known long ago, and was discovered, he believed, by Flinders in the first instance. H.M.S. *Fly* lay in it for several days, while Captain Blackwood and some of the officers explored the neighbourhood in boats. He generally accompanied one or other of the boats. So far as he could make out, this particular harbour was in a bight of the coast which the boats did not happen to visit; therefore they were not lucky enough to discover it. They did, however, find several other indentations in the coast, just south of Port Mole, which were tidal harbours. There was one fact which made the situation of this harbour exceedingly important, not mentioned in the paper: it was this, that the rise of tide upon just that portion of the coast was much greater than upon any other part of the eastern coast of Australia. The rise and fall of tide amounted in some places to as much as 30 feet—vertical rise and fall; while in scarcely any other part was the rise and fall more than 6, 8, or 10 feet, at the outside. This, it would be seen, was a very important fact in connection with harbours, because the rise and fall of tide would facilitate all kinds of operations connected with the building and repairing of ships. That point was sufficiently obvious. It was also important in connection with another curious fact—that this was, he believed, the only part of the coast, certainly the only part of the north-eastern coast, where there was good ship timber. The timber of Australia in general sunk when it was put into the water; it was too heavy and too brittle, for the most part, for shipbuilding. Just in that particular part of the coast from Port Bowen northwards up to Cape Upstart, there were large forests of pine, a species of *araucaria* called *Cunninghamii*, a species of the same genus that the Norfolk Island pine belonged to; and so far as he could judge, it was a very good ship timber. Some parts of the *Fly* were repaired from this timber. These two facts, taken in connection, made the existence of a good land-locked harbour there exceedingly important. When they were there, it struck them that that particular part of the coast, between Broad Sound and Cape Upstart, was by far the best bit of coast they had seen anywhere round the whole circumference of Australia. Mr. Evans had also recalled to his recollection that in the account of the voyage of H.M.S. *Fly*, which was published in 1847, this fact was noted: that after going twice round the whole of Australia, and visiting parts of the coast on every side, they came to this conclusion, that this was the very best bit of land anywhere to be found so near the margin of the sea. Of course they could only judge from what they were able to see of some two or three miles inland. All the country round about Port Bowen and Port Curtis was exceedingly barren and rocky in comparison with the country he was speaking of. Farther north there seemed to be a considerable stretch of comparatively fertile land along the coast. The hills themselves, instead of

being barren and rising abruptly from the sea, as was generally the case along the north-east coast, were at a distance of 30 or 40 miles inland. All along the north-east coast there was a succession of north and south ranges, which came out and ended on the north-east coasts with bights behind the termination of each headland; and the recess north of Broad Sound, between the hills terminating there and the next ranges which came out about Rockingham Bay, seemed wider than usual, and with more low land.

The Chairman had asked him to say something about the coral reefs. In obedience to that request he would endeavour to give a brief description. Starting from Sandy Cape, near Harvey Bay, the north-east coast ran up to Cape York, which was the extreme northern point of the continent of Australia on that side, south of Torres Straits. A little north of Harvey Bay there appeared a set of coral islands and coral reefs, and from there the whole coast was fronted with a continuous margin of coral reefs, stretching right along the face of the coast, and across Torres Straits close up to the shore of New Guinea. The distance was not less than 1200 miles in a straight line. Now, if you were to translate that reef into this part of the world, and supposing it started from the north-west coast of France, it would encircle the British islands, including Ireland, the Orkneys and the Shetland isles, and stretch away up to Drontheim on the coast of Norway. This would give some idea of the extent of this coral reef. Imagine, then, a great submarine wall rising from an unknown depth in the bottom of the ocean just up to the level of low water—not one continuous wall, because it was broken through in the upper portion by a number of tolerably deep passages, perhaps twenty or thirty fathoms in depth. These would be like embrasures in the top of a fortress. But below that depth there would be one continued mass of coral matter. This matter was carbonate of lime—solid rock, the same substance as marble—secreted from its solution in the waters of the sea, and made to enter into the solid parts of the structure of the minute polyps that formed these corals. Having thus assumed a solid form, some of it was triturated after the death of the corals by the action of the sea, and spread over and among the unbroken corals, and all compacted together into a hard mass. The finer particles were even carried out and strewn all over the bed of the surrounding ocean, so that in every case in the neighbourhood, even as far as Singapore and Java, whenever he had examined the bottom that was brought up on the lead, he found it altogether soluble in dilute acid. There was in that sea a great limestone formation, a great calcareous deposit going on, the result of the action of these little animals, at the present time, similar to the older great masses of calcareous matter, such as the chalk which stretched all over the south-east coast of England, and over a large part of Europe. These little animals had added to the bulk of the earthy mass of Australia a great slice of country, which was at present only comparatively a little underneath the sea, 1200 miles long, varying from 10 to 90 miles in width; having, in fact, an average of 30 miles in width, and making, if lifted up above the surface, a very large tract of country, a great table-land, appended to the submarine slope of that side of Australia. The depth from which this wall rose up on its outer edge was certainly not less than 2000 feet. They sounded in some places close up to the reef, sometimes within the general direction of the outer edge; for there were great convolutions in the line of the reef, great bays in it; and they sounded in these bays and found no bottom at a depth of 1800 feet. They never reached bottom with any line that was ever put down, except close alongside the reef, within a very few yards where the water broke upon the ridge. So they might certainly assume that the height of this submarine wall was 2000 feet for a great part of its course. This was simply a description of fact. But there was something still more remarkable, perhaps, to be said in connection with this coral mass than the fact that the whole of this huge bulk of matter was solidified by the action of animals

of a very low grade indeed; and that was this—that none of these animals could live at a greater depth than some fifteen fathoms. They never could have formed the huge bulk of matter which entered into some of those very large corals, some of them as big as the platform upon which he was standing, and rising to such a height that several persons could land upon one of them, and walk about without being in sight of those on the other side of the mass. All the animals that made these great reef-forming corals were confined, when alive, to the comparatively slight depth of fifteen fathoms. How came it, then, that these coral reefs could spring from so great a depth as 2000 feet? Simply in this way; that when the commencement of the reef took place, the bottom of the sea, which was now 2000 feet under water, was within the depth of fifteen fathoms; and that since then the land had been slowly subsiding and settling downwards so gradually that these little animals continued to live and flourish upon the upper and outer margin of the reef, while the waste and débris derived from them added to the mass; and thus the upper surface of the reef was kept up in this comparatively shallow stratum of water just below the level of low tide, while the bottom of it was slowly and gradually sinking down. So that the existence of these coral reefs along the north-east coast of Australia, and over a large part of the neighbouring seas, was one of the proofs we had of the depression of a large portion of the country. Australia, large as it is, was formerly, perhaps, even larger, extending at all events so much farther out on the eastern coast as would be represented by a width of from 10 to 90 miles. Just upon the margin of the then sea, these creatures began to settle and to build; and, since then, as the country sank and the sea came farther and farther in upon the sloping land, the coral reef increased and increased, so as to keep it up to the dead level of low water.

He need not enter at any greater length into the consideration of this wonderful physical phenomenon; but if they would allow him to occupy the attention of the meeting for a few moments longer, he would say a word or two upon the subject of the first Paper, which was so intimately connected with the southern part of Australia. His reason for doing so was this, that a good many years ago he committed himself by printing and publishing a sketch upon the physical structure of Australia. This sketch was founded upon his own observations—upon observations made in H. M. S. *Fly* during a period of nearly four years that was passed on the coasts—as well as upon the observations that had, previously to 1847, been published on the subject. He had also had the advantage of meeting Captain Sturt upon his return from his great and truly adventurous journey into the interior of the country in the year 1846, and of discussing this point with him. The structure of the country, so far as he knew it, was this: There was a great continuous chain of mountains running along the eastern coast from Bass's Straits to Torres Straits. This eastern coast range was the principal range of the country. It was the one in which there were the highest mountains, namely, the Australian Alps, and it was the one which was the longest range, and which retained a continuous height for the greatest extent. It extended along the whole of the eastern coast, its crests being at a little distance in the interior. In the Melbourne country the ranges of mountains, short as they might be, all run north and south; and that was the case also with the ranges in South Australia, as Colonel Gawler well knew. It was the case certainly with the Darling range in Western Australia, where all the hills run north and south. They did not know of any east or west range in Australia, unless it were that high land which Leichhardt reached in the northern part of the country, which seemed to stretch from Cambridge Gulf, and to sink gradually down to the southern part of the Gulf of Carpentaria. That being the disposition of the high lands, let them look for a moment at the direction of the prevailing winds. During the greater part of the year—certainly during all the part that we called summer in England—in the northern part of Australia, lying within the tropics, or north of about 25° s.

lat., the only wind was the south-east trade-wind. This wind was always blowing from the south-east or from the east-south-east; while at the same time a strong, fierce westerly wind, generally south-westerly, though sometimes north-westerly, was blowing along the southern part of the country. Up to about 30° lay within the region of the westerly wind. The intermediate tract between 30° and 25° was subject to variable winds, according to the season. In our winter, viz., in the December part of the year, there was a north-west monsoon blowing upon the north-west coast. He believed he might say without contradiction, that within the tropics invariably low land was desert unless there were some lofty ranges of mountains in the neighbourhood, so that rivers could flow from them into the low land. He believed this was the case without exception in every part of the world. It certainly was the case with regard to the northern part of Australia during one six months of the year at all events. The only high land was directly upon the eastern coast; the consequence was that the easterly wind striking upon that was drained at once of all the moisture that the high land could extract from it. The wind had to climb over that high land to get into a comparatively cold region up above: that cold condensed the moisture, and the current of air was drained of as much of its moisture as could be got out of it at that altitude. After it had passed over that range it met with no other high land whatever, for, so far as we knew, the generality of the country was low. Even that high country south of Port Essington, according to Leichhardt, was not so high as the eastern coast. Therefore there could be no precipitation during all that part of the year, at all events during the prevalence of this easterly wind; on the contrary, this low land, being heated by the burning rays of the sun, caused the air to expand, and therefore made it rise, and put it into a state to lick up any moisture that there might be, rather than to deposit it. There was constantly a current of air rising up from this northern half of Australia, and taking up any moisture that presented itself; and it did not impinge upon the Indian Ocean again until it got 150 miles out into the sea. At least they found it so in the *Fly*. Now, during all this time, and during the rest of the year, the westerly wind was blowing along the south coast where there were these broken ranges—these comparatively short ranges of mountains that he spoke of—and the southern part of the eastern coast range. What did they find? On the west side of each of the ranges you found a fertile country. There was a comparatively fertile country on the strip of low land lying west of the Darling range. It was a grassy and woody country, and precipitation of moisture frequently occurred; but on the east side of that range you got a desert, a sandy plain, which no one had ever succeeded in getting across. Then you came to that great tract of low country which Mr. Eyre attempted to cross, where he had to carry water with him for several days at a time, for he found no river running out towards the coast, and could only get water trickling at certain spots from the cliffs of the sea-shore. But when you crossed this flat, and approached the ranges of South Australia, you expected a precipitation of water from the westerly wind. And there you found it. Mr. Stuart stated that he had found a tolerably well-watered country just where it was to be expected. But observe that when you once passed over these north and south ranges of South Australia, and got on their eastern side, you again came upon a desert—that very desert country through which the Darling river occasionally ran, but where the rivers were mostly all dried up, often forming merely a succession of water-holes. Crossing these great flat plains, which were more or less desert, you at last struck on the eastern coast-range, and again got into a well-watered country, where you found the Murray and other rivers.

It followed from all this that he was compelled rather to differ in opinion from Colonel Gawler on one point. Taking for granted that Colonel Gawler's idea of the structure of the country—that the high land was ranged

round the coast, and that the interior was a great hollow—taking that to be the true description, he was afraid that the hollow, although there would be plenty of space in it for water, would not have any water in it. He was afraid that the very fact of its being low land would be a total bar to any moisture ever getting into it, and that all the drainage that poured down in that direction from the surrounding high lands would be licked up long before it got into the interior. The only chance was, that there should be some range of very lofty land running into the interior, and that during winter, or in December, the north-west monsoon, which was greatly laden with moisture, should blow well into it, and should throw down such a quantity of moisture as would fertilise some considerable tracts for the remainder of the year. The time when the north-west monsoon blew was the only time when it rained at Port Essington: during all the rest of the year they never had a shower. About November and December, and from thence on to March, when the north-west wind was blowing, they had thunder-showers almost every day, and a large deposit of moisture.

COLONEL GAWLER responded that, in saying that he believed the centre of Australia to be a great crater, he did not mean anything like a volcanic crater, but that there was simply an outer range of hills, with a drainage into this centre. Nor did he mean to say that there might not be considerable ranges in the crater. It appeared to him absolutely necessary that there should be, for he quite agreed with Mr. Jukes, that there could not be a running water without elevations. The facts which Mr. Stuart had elicited proved that there must be ranges; for in penetrating to a distance of nearly 500 miles from the head of Spencer Gulf, he (Mr. Stuart) declared that he never was in want of water. He also describes a broad river flowing towards the east.

MR. J. S. WILSON said, he had been exploring the north-west part of Australia. One great feature of Australia was, that it was a great table-land, with the exception of a few primary ranges of hills which protruded about it. Another great feature was, that at one time it was so depressed that the sea beat into that table-land. The table-land consisted of sandstone on the surface and shale underneath. All the valleys had been cut out by the action of the sea, and where the sandstone had by this means been removed, leaving the shaly strata uncovered, the latter by its decomposition became a good soil. But it did not follow that there was also a productive country, for rain was required to nourish vegetation. Now, on the north-west coast, rains fell during the north-west monsoon, and probably that part of the country was as well watered as any part of Australia. The slope of the country might throw considerable quantities of water towards the interior, and consequently there might be rivers striking down towards the central depression. It would, therefore, appear that the best season to pass along the country was during the prevalence of the north-west monsoon, which was just the opposite season to the wet season of South Australia. It was during the season of the north-west monsoon that the hot winds of Southern and South-Eastern Australia prevailed, and he believed the latter to be the extension of the former, which expended its moisture and became heated in crossing the continent. With respect to the probability of finding gold in that part of the country, he was of a different opinion. The quartz which had been found there was a silicious sandstone, very like quartz in appearance, only it was not of the same geological age, gold-bearing quartz being a vein-stone filling rents in the primary slate rocks, but the quartz of the Burra Range, and all other ranges of the interior, is a horizontal rock of the carboniferous period, and extends over very large areas.

MR. J. CRAWFORD, F.R.G.S., said, if the soil on the north-east coast were good, there was ample room for a profitable colony. Mr. Jukes showed clearly that it was a well-watered country, and wherever within the tropics there was a well-watered country, there was sure to be fertility. He had no doubt there

was abundance of good land extending from the 29th degree, the southern boundary of the new Queensland, up to the 15th or the 16th degree. Beyond that we did not expect much good land. God protect them from going to the Gulf of Carpentaria, although eulogised by some of our Fellows! We had tried it and found it wanting, but for the rest he had no doubt it would be an excellent place for all tropical products, such as the sugar-cane, the coffee plant, and, best of all things, cotton; and, moreover, they could obtain plenty of labour from the Chinese, whose industry was proverbial, and who would labour in any climates from the Equator to the 50° of latitude.

SIR E. T. BELCHER, B.N., F.R.G.S., was delighted to hear that Professor Jukes had found out that these coral islands did not exactly spring from the bottom. He had studied the subject himself with great attention for many years. He was instructed, when commanding H.M.S. *Sulphur*, in the Pacific, to bore through one of these coral islands, and endeavour to determine whether it was based on the lips of a submerged volcano. Selecting Bow Island, he cut about 9 feet through the coral, and he then came to mud, a kind of pipe-clay. He continued cutting down until he reached 46 feet: there it was found so fluid that it was pumped out with a ship's engine! He afterwards carried out a line of soundings from Bow Island entrance, beginning at 3 fathoms and going down to 1600 and odd fathoms (9600 feet). He found the coral terminated abruptly at about 900 fathoms, all beyond that depth being sandy coralline debris. Mr. Jukes had not exactly explained the constitution of the coral that is between living corallines and coral rock, or the component parts of the solid coral which he had found. All recent corallines had very porous cells, but none of the solid coral exhibited any trace of porosity. It was formed apparently of the very fine *débris* agglutinated together, and it came to us pretty nearly in the same condition as the fossil corallines, with a surface which was capable of high polish. He believed Mr. Jukes was also quite right as to the depression of the coral, but he did not believe that the main land had ever shrunk an inch. He formed that opinion in 1825, after three years' constant examination of the Bermuda Reefs. When he went out in 1825, in H.M.S. *Blossom*, he examined the Dolphin Reef, on which the *Dolphin* struck when the island was first discovered. He made a very minute survey of it, because he then had an opinion that the coral reefs never rose from below. He did not find a living coralline on the reef, nor were any found at Loo Choo, of which Basil Hall gave such a glowing description. At that time the coral barrier round the island of Tahiti was so high that the *Blossom*, drawing but 16 feet, could only be forced into the harbour of Oututu Tuane by hand through a side opening in the barrier, and a boat could scarcely pass to Papeete. But when he returned to the same place, in 1840, in H.M.S. *Sulphur*, the *Artemise*, a sixty-gun frigate, had passed freely through the same opening on to Papeete; and a tree beside the spot where the Consul's house formerly stood, and to which the *Blossom's* cable was shackled, had three fathoms of water under it: consequently the whole of the coralline had been worn away, or possibly gone down, but the main land had not altered in the least. The American Expedition left a datum mark on Point Venus, so that the fact may be determined. To return to Bow Island: he examined and sounded it originally in 1825, with a thorough conviction that some day or other it would be his lot to return to the Pacific; and when he was instructed to make the borings alluded to, he fixed upon that island, having made such minute observations upon it in the first instance. There was one little islet within the lagoon on which he was accustomed to bleach his corals; that islet had disappeared altogether, and was not to be found in the new survey! When he first went there the whole island was belted with a continuous line of coconut trees; but at his last visit, after 15 years' interval, a small boat might have passed through some of the worn coralline channels. His belief was this: that these corallines were constantly working upon the edge of these lands;

that the sea was breaking them, and rubbing them down by attrition; that they slipped down gradually till they reached a certain depth, and formed a coral facing much in the manner that glaciers are formed; and that it was upon this new coating that these small animals formed, and upon which the others kept growing. He also disagreed from Mr. Jukes on another point, for he had brought up living corallines (massive coral) from the depth of 33 fathoms, and he once brought up a living coralline, a tree on a strombus, from a shoal at 156 fathoms; both strombus and coral were living. At Bow Island he had occasion to construct a pier. The coralline circles resting upon the fine sand, about 6 to 9 feet in diameter, were taken up, not having any attachment, and were wheeled, to the amusement of the crew, into the places assigned for them. I do not think any measured more than a foot in depth.

MR. JUKES said that you might bring up from 100 fathoms living corallines, but he expressly guarded himself from saying that all coral-making polyps lived only in shallow water. He said it was only the polyps that made these huge corals that lived within a comparatively short distance of the surface. Of course there were corallines that lived at a greater depth—at any depth in which life could at all exist. With respect to the theory of the formation of coral reefs which the gallant officer seemed to attribute to him, he had learnt it entirely from Mr. Darwin's book.

THE CHAIRMAN, in closing the discussion, said that he had derived much information from Colonel Gawler, and he was certain they would thank him for having called upon his geological friend Mr. Jukes. The remarks he had made showed how intimately geology was connected with those great problems of physical geography which Mr. Jukes had so admirably depicted. In short, he (the Chairman) was quite proud of his geological associate, who had clearly shown why a large mass of the interior of Australia must be a waterless desert.

Ninth Meeting, March 26th, 1860.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*Consul D. B. Robertson; Captain A. E. Wilkinson; and J. A. Dickinson; W. H. T. Huskisson; Samuel Kinns, PH. DR.; Daniel Meinertzhagen; and J. P. Stocker, Esqrs., were presented upon their Election.*

ELECTIONS.—*Colonel the Hon. Arthur Egerton; Major George Wilcock; and Roger Cunliffe; Bernard Dietz; T. M. Mackay; Alexander Mitchell; R. M. Montgomery; H. W. Peek; and David Walker, Esqrs., were elected Fellows.*

EXHIBITIONS.—Captain Berger's patent Sphereometer, invented for the purpose of obviating abstruse calculations in Navigation, and for facilitating passages, was exhibited at the meeting.

Among the donations to the Library and Map-Rooms since the former meeting were "Cycle of Celestial Objects," continued at the Hartwell Observatory to 1859, by Admiral W. H. Smyth, presented by the author and Dr. Lee; Swedish Government charts, presented

through His Excellency Count Platen, F.R.G.S.; Meteorological Papers published by the Board of Trade, &c.

The Papers read were—

1. DR. LIVINGSTONE on *Lakes Nyinyesi, or Nyassa and Shirwa, in Eastern Africa.*

Communicated from the FOREIGN OFFICE by the RIGHT HON. LORD JOHN RUSSELL, F.R.G.S.

DR. LIVINGSTONE, in company with Mr. C. Livingstone, Dr. Kirk, and Mr. Rae, has traced the Shiré River up to its point of departure from Lake Nyinyesi or Nyassa, and found that there were only 33 miles of cataract to be passed. After this interruption the river became smooth again, and continued so right into the lake, in lat. $14^{\circ} 25' S$. The country adjacent to the Shiré is formed of three well-defined terraces. The first of these is the actual valley of the river, elevated from 1200 to 1500 feet above the level of the sea, and exactly like the valley of the Nile at Cairo. The second terrace lies east of this, and is upwards of 2000 feet in altitude, and 3 to 4 miles broad. The third terrace is, again, eastwards of this, and exceeds 3000 feet in altitude. It is bounded on the east by Lake Shirwa, and by a range of very lofty mountains. Based upon this last terrace is Mount Zomba, rising to an additional height of 7000 feet. Thus at a few miles' distance from each other very various climates exist. The second and third terraces were cool, and even cold, and largely supplied with running brooks.

The terraces are extensively cultivated with cotton, of foreign origin. No information could be obtained of the length of Lake Nyassa; that of Lake Shirwa is 90 miles. The two lakes are separated by a narrow isthmus. There was no appearance of the water of Lake Nyassa ever rising or falling much. The River Shiré does not vary more than 2 or 3 feet from the wet to the dry season. It issues from the lake in a stream of from 80 to 150 yards broad, 12 feet deep, and running at $2\frac{1}{2}$ knots an hour.

All trade from the interior to the coast, lawful and unlawful, crosses the narrow isthmus that separates the two lakes, and it is there that Dr. Livingstone thinks slave exportation might most easily be checked. The natives were intelligent, and are great agriculturists: the worst feature about them was frequent drunkenness, from over-use of native beer and Indian hemp.

The CHAIRMAN ventured to say that the Secretary of State for Foreign Affairs seldom received from consuls and diplomatists a clearer account of the physical geography of a region than was given in the few pages sent home by his friend Dr. Livingstone, and now communicated to us by Lord John Russell.

It appeared that the Shiré, a magnificent river in itself, was separated by cataracts (requiring a portage of about 30 miles) from the great river Zambesi, by which alone water communication with the sea can take place from the interior of the Continent. Dr. Livingstone has pointed out the healthfulness of this country, in which he and his friend Dr. Kirk slept so many nights without changing their wet clothes, and yet never had an illness. Dr. Livingstone had certainly realised the truth of what he said after he first went to Africa, that there were healthy lofty regions in that country in which Englishmen might live in perfect health.

In calling for any observations upon this tract of Africa, he could not sit down without adverting to another lake much to the northward of these two great lakes of Livingstone, the Shirwa and the Nyanzi, to that lake Ngami which was discovered by Captain Speke. When he told them that Captain Speke, who, a fortnight hence, would proceed on his adventurous journey, was present, as well as Mr. Petherick, our vice-consul at Khartum, who was likely to ascend from the upper sources of the Nile, and give a helping hand to his friend Captain Speke, in his endeavour to push to the northward to discover the real sources of that great river, he thought the meeting would like to hear something from both these gentlemen connected with the projected explorations of the interior of Africa, which would, he trusted, end in the discovery of the true sources of the Nile.

CAPTAIN SPEKE, F.R.G.S., said Dr. Livingstone's communication was most interesting, inasmuch as he had himself obtained considerable oral information of the same country of which the Doctor had now given them a positive account. He had first heard of the lake recently discovered by Dr. Livingstone only as the Nyassa or Lake when at Kilwa; now, however, the discoverer had given them its true specific name, in calling it Niyanyizi, meaning in the Negro language the Stars, and Dr. Livingstone would do well to call it Niyanyizi Nyassa, or the Lake of the Stars. It was a peculiar coincidence that the negroes should have two of the night luminaries, as Unyamuezi the Country of the Moon, and Niyanyizi the Lake of the Stars, to designate two great topographical features of their benighted land by; and it is also remarkable that, both being so close together, the latter had never been heard of, though the former, the Moon, had been well known for centuries.

The Captain said he entertained some doubts about the opinion expressed by Dr. Livingstone as to the means of check-mating the slave-trade by simply stopping their passage between the two lakes, as mentioned in his paper; for whilst at Kilwa he had been to some considerable trouble in collecting information regarding that subject, and was assured by many native traders that they crossed the lake in boats at various ferries along its shores, and the missionaries had also heard this story from the same sources. Still it was conjecture, and he hoped Livingstone would soon push farther up the lake and see how closely it approached to the Tanganyika Lake, which is about the same altitude as the Niyanyizi Lake (1800 feet), and would much enhance the value of the two discoveries, should it prove that any connection existed between them, and the more especially so as Dr. Livingstone described that country in such glowing terms, as capable of producing anything that grows in tropical climates, including even cotton.

But when talking of Africa as a cotton-producing country, and although giving credit to its having a productive soil, he (the Captain) did not wish it to be inferred that it would be of any immediate use to us, for at present there were no regular organised and established governments there, nor would there be any until slavery ceased. Slavery, he maintained, was the first and great cause of, and impediment to the development of the resources of the country. Fortunately for Africa and for England, he might also say, these discoveries of rich and fertile lands—mainly attributable to the indefatigable exertions of the Royal Geographical Society, who are now pressing their adventurous

members on that land—would eventually be the means of suppressing slavery ; for when explorers point out these sources of wealth, the merchant's cupidity becomes excited, and with it means are soon devised to satisfy the desire.

In reverting to the compliments paid him (Captain Speke) from the Chair, and the acknowledgments he received from the meeting, in their unanimous approbation of his appointment to the command of the Expedition, he said he was highly proud of the selection the Society had made of him, and trusted they would never repent having done so ; but the best security he could offer them was, in saying that his interests were identical with those of the Society, and that they might be sure he would do the best for them. It had been truly gratifying to see the warm support he had received from the Home and Indian Governments, who had really been very liberal in support of this Expedition to determine the source of the Nile, which he believed he had already discovered, and was now simply going to confirm the belief. He expected to have no difficulty whatever in travelling from Zanzibar by the country of the Moon, and up the west side of the Victoria Nyanza to Uganda (the kingdom of), beyond the Equator, to which place Arab caravans go ; but beyond that point he knew there would be difficulties, which are so great as to be insurmountable to all native merchants, and, as yet, no one had gone north beyond 2° north latitude ; such at least were their unanimous statements when he questioned them on the last journey. Since returning to Europe he had met Mr. Petherick, who, unknown to himself, and while he had been exploring close to the southward of the Equator, was also travelling amongst the tribes to the northward of it, and had brought back names such as he had heard of and inserted in his map, as Bari and Wangara, the latter probably meant for his Wanyoro. These tribes, he was informed by Mr. Petherick—quite in conformity with the Arabs' accounts of them—were so hostile to one another that they never mixed, and penetration amongst them would therefore be most difficult. He (Captain Speke) had consequently proposed to Mr. Petherick to make a combined advance simultaneously with him on those tribes which lie in a short compass of two or three degrees immediately to the northward of his lake, and due south of Gondokoro, the German Mission Station on the Nile ; Mr. Petherick to come towards Uganda from the north, while he went northward to the Nile, hugging any river he might find running out of the lake. Now as Mr. Petherick had readily assented to co-operate with him, and as so much hung upon the security or otherwise of the undertaking, he hoped that that gentleman would receive the same support from the Government which he had done. It was a matter of purely false economy to withhold any means, now that we have the Nile's head in a corner, for searching it out ; and he regretted excessively that the Expedition which was so judiciously proposed by Lord Elphinstone, and which should, starting from Mombas, have travelled north-westward, passing by the snowy Kenia, and made for the same point as themselves, have been allowed to drop for want of a little support at the critical time ; for the more expeditions are on foot at once the greater security there is in travel to all, by the diversion which they create in the minds of the people.

MR. CONSUL PETHERICK, F.R.G.S., said that he was most happy the Government had been so liberal towards the Expedition sent out by the Society under Captain Speke, and hoped his travels would be successful. Captain Speke had described the natives of South Africa as totally different from those with whom he was acquainted to the north of the Equator. It would appear that the natives to the south were better disposed towards strangers than those to the north, probably because the Arabs from the eastern coast, for centuries past, had been in the habit of penetrating these countries for the purposes of trade, and had established posts or trading places in the interior, thus had become known to the people as perfectly harmless. Now the tribes to the north of the Equator had known no such trade, and they were most hostile not only to

Europeans, but to men of their own colour, and there were even subdivisions of tribes which made war upon each other.

During his peregrinations, the necessity of having a large number of servants armed, who were thereby unqualified for carrying any of the provisions, or even necessaries for themselves, naturally imposed upon him the duty of employing a still larger number of men to carry provisions for the party, and also the merchandise wherewith to purchase necessaries in the interior.

This difficulty was further increased by the impatience of the tribes to obtain glass beads and other ornaments, for, instead of waiting to obtain them in the legitimate way of trade, they made frequent and sometimes rather awkward attempts to get possession of them in an illegitimate manner, and he had been frequently compelled to prove to them that powder and ball were more persuasive than bow and arrow, or lance and club. This being the case, he felt sure Captain Speke would have considerable difficulty in making his way through these tribes. There was something more than bravery required—a knowledge of the people, of their habits, and of their language, was essentially necessary; these Captain Speke unfortunately did not possess. Therefore, having these advantages himself, he believed that were he to meet him, he should be of considerable assistance in bringing him from the Equator to the Nile. And although he was engaged in trade, and had five or six establishments to look after, yet he would not allow his friend to remain in the lurch while it was in his power to assist him. He was also firmly persuaded that unless Captain Speke were met by himself, or by boats duly armed and provisioned, he would not be able to bring his party down the Nile, owing to the absence of food and conveyance. For only two months in the year did boats remain at Gondokoro, and unless he arrived within these two months, December and January, he would find no boats there to bring him down to Khartum. He would also find himself among the Bari, a most savage tribe, who would not give themselves the trouble to cultivate grain, and for the last five or six years had been so unable to sustain themselves, that they had been compelled to barter ivory for grain.

In assisting Captain Speke, the only thing he required of the Government was, that they should allow him sufficient money to enable him to place a couple of well-armed and provisioned boats at the service of Captain Speke, and to retain them at Gondokoro until his arrival. If these suggestions of his met with favourable consideration, he believed that then everything which human foresight could devise would have been attended to, and that they might hopefully and cheerfully look forward to the triumphant success of Captain Speke's expedition.

The CHAIRMAN said it was exceedingly desirable that Government should grant that additional power to Mr. Petherick which would enable him to lend real assistance to Captain Speke at the time of need, or rather permission to act as an exploring and roving Consul beyond the limits of Sudan should be granted to him. If this should be granted, and the Expeditions should be successful, then to British enterprise would be due the glory of having made a discovery which the Romans, in the plenitude of their power, failed in accomplishing.

The second Paper read was—

2. *Sketches of the Hilly Dagistán, with Lesghi Tribes of the Eastern Chain of the Caucasus.* By BARON DE BODE.

Communicated by DR. THOMAS HODGKIN, M.D., F.R.G.S.

DAGISTÁN is probably less known than the remainder of the Caucasian chain west of the Caspian. That part of the Caucasus is split up into hill and dale, with offshoots from the principal snowy range; but Dagistán is formed of stupendous barren granitic masses, that form a high table-land, intersected by rapid streams. There are no roads in the country, nor do the foot-paths of the inhabitants serve, without difficulty, for beasts of burden. The small amount of cultivated ground that exists in Dagistán consists of small terraced gardens, high on the hill sides, often at points very difficult of access.

The ethnography of the Caucasus is exceedingly complicated, owing chiefly to its having been a thoroughfare to the hordes of Central Asia, and to the encroachments of surrounding races. Baron de Bode's paper is largely occupied with a discussion on the origin of the Lesghi of Dagistán, who were under the sway of Schamyl, who are totally distinct from the Cherkesses (Circassians), and are geographically separated from them by the military road that joins Tiflis with Russia.

The CHAIRMAN said the Society were exceedingly indebted to Baron de Bode for the account he had given of the interior of a country with which we were so little acquainted. The contrast which he had drawn between the Tcherkess, or Circassians, and the Lesghi of Dagistán was very striking. This was not, however, the first time the Society had been indebted to Baron de Bode. Many years ago he contributed a valuable paper on a portion of Persia to the south of the great Caucasian chain, the north-eastern parts of which he had described on the present occasion. Baron de Bode was so thoroughly acquainted with the habits of the people, and their language, that it was of great value to receive from him so vivid a description as they had just listened to. They had present an experienced English geographer, General Monteith, who, twenty-three or twenty-four years ago, explored this very region, and who had still many unpublished documents on the subject.

GENERAL MONTEITH, F.R.G.S., observed that the name of Dagistán (simply, Country of Mountains) would be applied by the inhabitants of the low country to any part of the Caucasus; from which, he presumed, has arisen the mistake on the map of the locality of the Lesghi, whose country is particularly mentioned as Dagistán, is bounded on the west by the Aksi River, extending to the Caspian on the east, to the north nearly to the Terik, and the south the frontier of Georgia, Kakhelia. Half-way between Derbend and Kislar is situated the town of Terki, formerly the capital of the Shum Khal or Chul, the great Lesghian confederation. The four great divisions are the Kasi Kumaks, Kafer Kumaks (so called before their conversion to Mahomedanism), Avars, and Ah Kourhchey (white Falcons). All the Lesghi are comprised in these four tribes, though many mixed clans exist. There is consider

in the language, but generally they understand the Avar dialect. Their government is purely democratic, and the chiefs properly are elective. The arms made in Dagistán are of a very superior quality; excellent rifles are manufactured, and exported to both Turkey and Persia. Their country is highly cultivated; very good cloth is made, and their cloaks, or yapoonchas, are in general use in the neighbouring states of Persia, Georgia, and Turkey. Their schools furnish mullahs to the Caucasus generally. The place marked in the map as Dagistán is chiefly inhabited by the Chilchens, Kista, and other tribes of a distinct race. The troops of Dagistán are almost entirely infantry. Their cavalry are inferior, and the only good horse are from the Tartar tribes of Yaksi and Yamout.

The Circassians differ entirely from the Leaghi. Their dress, habits, government, and language, have nothing in common. The Circassians are a feudal people, with three classes of nobility, who serve generally as cavalry, which are of the best quality. From this people the best Mamelukes were drawn, and they were the great slave-dealers of this country. Some slaves of the Circassians, at a very early period, submitted to Russia, and served in their army. The Circassians became Mahomedans in the middle of the last century.

Tenth Meeting, April 23rd, 1860.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*Consul H. S. Freeman; the Rev. T. W. Prickett; H. W. Peek; and W. Smith, C.E., Esqrs., were presented upon their election.*

ELECTIONS.—*Major-General Randall Rumley, Vice-President of the Council of Military Education; Andrew Arcedeckne; Francis Black; James T. Mackenzie; Richard Biddulph Martin; Thomas Michell; Harry Norris (Colonial Office); Hodgson Pratt; Robert Rintoul; Benjamin Coulson Robinson; and Alfred Sartoris, Esqrs., were elected Fellows.*

ANNOUNCEMENTS.—It was announced that a communication had been received from Sir G. F. Bowen, F.R.G.S., Governor of Queensland, stating that he had appointed Mr. Augustus C. Gregory (Gold Medallist, R.G.S.) as Surveyor-General of Crown Lands for that colony. It was also announced that the Admiralty had granted, in accordance with the request of the Council, to Captains Speke and Grant a free passage to the Cape, *en route* to Zanzibar, in H.M.S. *Forte*, which would likewise convey his Excellency Sir G. Grey, F.R.G.S., and Admiral Sir H. Keppel to that station.

EXHIBITIONS.—A series of beautifully executed sketches in Texas and Mexico by the Abbé Domenech, six years a resident in those countries, and some maps of the Swedish Government survey, were exhibited.

The Papers read were—

1. *Expedition into the Interior of South Australia.* By the Governor, Sir R. MACDONNELL. With a Letter to Sir R. Murchison, Vice-President R.G.S.

SIR RICHARD MACDONNELL, with a party of six persons, 20 saddle and 10 pack horses, left Angipena in October, 1859, on an exploratory tour to the northwards, following the direction of the late discoveries. They had found more difficulty in procuring feed for their horses in the settled districts south of that place than subsequently fell to their lot to experience in any other part of their long journey. Sir Richard first made an examination of the Appealina and other mines, whose reported mineral wealth appears to have been greatly overstated. He then proceeded by Mount Lyndhurst to the Mount Attraction Springs; then to the Finness Springs, which seem of considerable importance; thence to Blanche Cup; and finally to the Loddon. Nearly all the springs in this part of Australia are in the vicinity of large lagoons and salt-creeks. Most of them are of the same type, consisting of stony mounds, with reeds at the top and a hollow basin in the centre, containing water from a few inches to six feet in depth; while from each cup, either over the brim or from the side, issued a stream proportioned to the strength of the spring. The waters were not brackish, but they seemed to promote thirst. The climate promised to be favourable to those who might be able to provide a shelter against the great heat of the sun. The nights were cool. The Governor reached Adelaide by the end of December, after a rapid and arduous expedition of nearly 1800 miles.

In Sir Richard's letter to Sir R. Murchison he touches on many points of geographical interest. He mentions that springs similar to those of Blanche Cup, &c., that is to say, consisting of small conical hillocks, hollowed at the top, and containing water which overflows the brim, have been found in lat. 31, due west of Mount McPherson. He hopes that the most arid and difficult parts of Australia may be opened up by means of these springs, for they occur in very unpromising localities.

He also mentions, with regard to the country lately traversed by himself, that Mr. Goyder has been despatched on a two years' expedition, with a well equipped party, in order to map it out.

The second Paper read was—

2. *Voyage up the Darling and Barwan Rivers.* By W. R. RANDELL, Esq.

His Excellency Sir R. Macdonnell reports the successful navigation of the Darling by Mr. Randell, not only beyond Mount Murchison, but to a point 120 miles by land higher than Fort Bourke, or 1800 miles by water above the junction of the Darling and the Murray, or, altogether, 2400 miles by water above the sea mouth of the Murray. The same gentleman has from the first been one of the most enterprising and successful navigators of the Australian rivers. His small steamer, the *Mary Anne*, was the very first that undertook a voyage up the Murray, as, in 1853, it not only preceded the *Lady Augusta*, but also reached a higher point than that vessel. Great importance is attached by the Governor to Mr. Randell's recent expedition. That gentleman describes the river above Fort Bourke as even easier to navigate than below it. He was stopped, in about 29° 25' S. lat. and 147° E. long., by a rapid of 8 feet fall in two or three hundred yards, a place where the Blacks have constructed numerous weirs of stone for capturing fish. He believes a passage through this might easily be made, and steamers warped up it, when another 100 miles would be open to navigation. The river banks are occupied by settlers, up to Mount Murchison. Beyond that point the country greatly improves as a sheep country. The timber is not so plentiful as on the Murray, but it is much superior in quality. The natives are numerous above Mount Murchison. Mr. Randell considers the navigation of the Darling could be largely improved with little difficulty, first by clearing its bed of snags, which might be done at once; and, secondly, by damming up the backwaters and constructing some locks.

COLONEL GAWLER, F.R.G.S., regretted that Sir Richard Macdonnell was obliged to stop short in his journey, for fifty or sixty miles to the north-westward of the point he reached was that mysterious river which Stuart described, in some places three miles wide, flowing from east to west. It must be an extraordinary river, for the breadth and volume of water indicated a long course. Its source was probably far away to the westward, and, judging from the observations of Eyre, the atmospheric indications seemed to lead to the conclusion that there was a well-watered country in that direction. The mountains of South Australia were primary, and probably the same formation reappeared in the interior, rising perhaps to still greater elevations than in the south. Then came the interesting question of where was the embouchure of that river? It was impossible that it should have a mouth upon the coast, and the probability was that there was a great inland sea into which it emptied itself. He was of opinion that these inland bodies of water once had their waste-pipe by Lake Torrens into Spencer Gulf. The Governor found a deficiency of surface-water over large tracts of country, but a great abundance pouring out in an extraordinary manner from

rounded hillocks. In all tertiary and in most secondary formations water was to be got by digging, and these hillocks reminded him of similar hillocks in Syria, which were evidently craters of extinct volcanoes, and which nature had turned into Artesian wells. The paucity of natives seen by the Governor was a remarkable circumstance, and one did not know how to account for it. Probably they were to be found congregated round the inland sea. In connection with the general subject, he had recently seen the interesting journal of Mr. Selwyn, the Government geologist of Victoria, in which he described the geological formation of Southern Australia and also the beauty of the scenery. There was not a more beautiful country in the world. The mountains were massed together and rose in a most picturesque manner to heights varying from 2000 to 3000 feet, indented by beautiful valleys and ravines. The mountains were covered to their very summits with magnificent stringy-bark forests, and the bases were covered with forests of the gum-tree—trees as large as any in our parks, filled with kangaroos and emus, and birds of the strange Australian character; altogether presenting a country in which, in travelling through it, you were more constantly than in any country, almost, inclined to say, “I should like to build a house there.” Then, this beautiful scenery was connected with a beautiful climate. The heat was great in summer, but there was nothing oppressive in it. There was a large amount of ozone in the atmosphere. Even the marshes on the banks of the Murray were not unhealthy: surveying parties had lived by them for six and eight months together. Captain Pullen, of the *Cyclops*, was in the Murray reed-beds for nine and twelve months together without a single case of fever in his party. Here, then, was a country to which we might turn our eyes with satisfaction, and be delighted to fill it up with the surplus of our population; and he rejoiced that it was in the mind of the Governor and of many others to explore the interior and extend our knowledge of this beautiful country more and more until the whole should become a magnificent rest for civilised man.

The CHAIRMAN said, that in the communication which had been made by the Governor there had been so many references not only to the physical geography of the country, but to its geological structure, and they had been so particularly asked by the Governor to give some geological explanation of the origin of fresh-water springs, which occurred as oases at great distances from each other in this vast country, and by which springs alone we could hope to obtain communication with the northern portions of the continent, that he hoped his friend Mr. Jukes, who had been many years in the country, and for whose geological accomplishments he would answer, would state his ideas as to the origin of these fresh-water springs, and give a general view of the physical geology and saline deposits of that great country.

MR. J. BEETE JUKES said he would endeavour to give a slight general sketch of the geology of the country, as far as he knew it, and then endeavour to say something about the question of water-supply. The eastern coast chain was entirely composed of palæozoic rocks. No part of this chain south of Cape Melville was less than 2000 feet above the level of the sea, and there were ridges that rose occasionally to 4000 feet, and in the Australian Alps to within nearly 7000 feet. Again, the minor ranges that ran north and south through Victoria were in the same way composed of palæozoic rocks. The same was true of the north and south ridges which stretched from Western Australia, in the neighbourhood of King George's Sound up to the North-West Cape. With respect to the east and west ranges south of Port Essington, and which struck the coast about Cumberland Inlet, he believed they were also composed of palæozoic rocks. Certainly there was granite there in considerable masses, for Leichhardt mentioned the fact in his book. All the high grounds of Australia consisted of these older aqueous and igneous rocks. Now for the flat country: according to Eyre, all the way from South Australia to Western Australia there was an unbroken range of cliff, varying

500 feet in height, so unbroken that it was only here and there that Mr. Eyre was able to scramble down some of the minor gullies, in order to supply himself with the water that oozed out just at the base. There was not a single river course nor a single valley which could give a channel to a river course between the palæozoic rocks of South Australia and the palæozoic rocks of Western Australia. Mr. Eyre described the geological formation of this great expanse always in the same terms, which proved that they were horizontal beds of tertiary rocks. He described them sometimes as chalk, and sometimes as oolite, with flints, and containing oyster and other shells. There was flat land on each side of the ridges of South Australia, likewise composed of horizontal tertiary rocks, as was the case also round Port Phillip. There was another expanse of flat land to the north of Western Australia running for hundreds of miles between North-West Cape and the hilly ground of Cumberland Inlet. The only information we had about it was derived from the marine surveys. No large river came out there; the coast was very low, fronted by sand-hills; and the view of the interior showed a great plain covered by salsolaceous plants. Coming next to the Gulf of Carpentaria, all the accounts agreed in showing that the land was very flat all round the head of the gulf. No fossils were ever found there, therefore it could not be said positively that these plains were tertiary; but this was known, that no large river came out anywhere round the Gulf of Carpentaria. Large river mouths were passed; but Leichhardt always said they were full of salt-water. There were certain rocks making the flat land about Port Essington, resembling lithologically the rocks on the opposite side of the continent, those round Port Phillip especially. Putting all these facts together—that wherever you found these flat lands, and could identify the rocks underneath them, you found horizontal tertiary rocks, and connecting these great flat plains, which we knew existed on these three parts of the coast, with the great plains of similar rock that Sturt passed over when he penetrated into the interior, and that in the plains about the junction of the Darling and the Murray you got similar tertiary rocks—it did seem to him in the highest degree probable that all the interior of Australia was a continuation of the same flat plain, made of the same horizontal tertiary rocks. These tertiary rocks were all more or less porous. The beds of limestone were tolerably thin, and interstratified with beds of sand, so that water would readily sink through them.

Next, as to the water that fell upon this ground. No doubt in certain seasons—he did not mean in certain parts of the year, but in certain groups of years—there were large falls of water over a great part of the country. Accordingly, after two or three wet years all the low lands would be saturated with water, either on the surface or beneath it. Lakes would then be filled with water, broad lagoons would be formed, and actual streams, occasionally, when great floods ran off the land. But this did not give any permanent supply of water or permanent navigable rivers. The water rushed off as a flood, formed a river for a time, and the remainder then sank below the surface. When once it sank to a considerable depth, where it was protected from subsequent evaporation, there would be a supply, which might be reached by digging wells; but it would be below the surface, not upon it. That the general character of the climate of the country showed this alternation of wet and dry periods he thought might be proved by going a little back into history. Tracts of country which were once covered with water were now dried up and converted into farms, and what were described as inland seas had disappeared when the country was visited by subsequent explorers. An instance of the uncertain nature of the rivers occurred to himself at Swan River, since in riding up the upper part of the Swan he had at one part a long reach of water on his left hand, and a few miles farther on he found a reach of water on his right hand, without having had to cross any water. He at first thought it was a second stream; but he remembered that he had a little way back ridden across a

gravely hollow, which was no doubt the dried up bed of the river. This was the general character of the rivers, and it was quite possible that for several years you might take a steamer up the Darling 1500 or 1800 miles, nearly to its source, and that for the next ten years you would not be able to take a single boat up. This resulted from the want of elevation in the mountain ranges. The Murray River, which was always navigable and a perpetually flowing stream, took its rise from the Australian Alps, the summits of which were covered for the greater part of the year with snow, the melting of which kept up a constant supply of water. Still, even with this river it was only occasionally that you got an opening into it from the sea. The mouth was blocked up with sand, and there was not a greater depth than three feet over it, the drainage of that part of the country not being sufficient to keep the mouth of the river open, as it would do in a country where there was a regular fall of water. He did not believe with Colonel Gawler that Lake Torrens was only the ancient embouchure of the streams he had mentioned, but the present one, and the only one it ever had, and that no more water had ever come out on an average of years than came out now. These facts proved to him that there could not be a well-watered country over the whole of the interior of Australia. There might be large oases; but generally it must be a dry country, or else the overplus of drainage would come out in considerable rivers somewhere. The fact mentioned by Gregory that after ascending the basin of the Victoria and crossing the water-parting at no greater height than 1400 feet, he soon came down upon salt lakes, proved that it was an arid country, in which the evaporation was greater than the waterfall, or the lakes would not have been salt.

The springs mentioned by Sir Richard Macdonnell were very curious and interesting, and he was for some time puzzled by them. It appeared to him that the water must contain a great quantity of carbonate of lime in solution, and that these cups were nothing more than calcareous tufa that had been deposited gradually by the overflow of the spring, until finally the deposit made a mound, through which the water continued to well out, just as in the case of the siliceous mounds round the geysers in Iceland.

The third Paper read was—

3. *On Typical Mountain Ranges.* By WILLIAM SPOTTISWOODE, Esq.,
F.R.G.S.

In an elaborate memoir published in the 'Petersburg Transactions,' Series VI. tom. viii., Dr. Abich has grouped the mountain ranges of Western and Central Asia under four heads, and deduced a mean direction for each group; but in doing so he has simply taken the arithmetical mean of the direction of the ranges under consideration, without reference to their length or their elevation. Mr. Spottiswoode shows the method by which the calculation of a mean direction ought justly to be made; not only by taking these omitted data into account, but also by using the calculus of probabilities to find whether or no, that mean direction be a *typical* one. Mr. Spottiswoode's object is not so much to correct Dr. Abich's conclusions on this particular point, which are, in fact, independent of

correction afforded by the calculations in the present instance, as to suggest and exemplify a new problem in physical geography.

He accordingly examines one of the groups of Dr. Abich, consisting of 24 mountains. He first finds the mass of each from the data of their length, of their elevation, and of the slope of their sides, which latter, in absence of better information, he assumes to be the same in every case. Now this mass corresponds, in mathematical language, to the '*weight*' of an observation, and is represented by w .

Next, he takes $\theta_1, \theta_2, \dots, \theta_n$ as the angles between the several mountain ranges and the parallels of latitude, drawn through the middle points of the ranges; in which case, by well-known formulæ, the probable typical direction of the chain will be

$$\Theta = \frac{\sum w \theta}{\sum w}$$

Moreover, the probable *errors* (or deviations) of the various ranges from the typical range will be $\epsilon_1 = \Theta - \theta_1, \dots, \epsilon_n = \Theta - \theta_n$.

The mean error (deviation) of an observation (range), whose weight (mass) is unity, will be

$$\eta = \sqrt{\frac{\sum w \epsilon^2}{n-1}}$$

The mean errors of $\theta_1, \theta_2, \dots, \theta_n$ respectively, or the "errors (deviations) to be feared" will be

$$\epsilon_1 = \frac{\eta}{\sqrt{w_1}}, \epsilon_2 = \frac{\eta}{\sqrt{w_2}}, \dots, \epsilon_n = \frac{\eta}{\sqrt{w_n}}$$

And the mean error E (deviation) of Θ , or "error (deviation) to be feared" will be

$$E = \frac{\eta}{\sqrt{\sum w}}$$

So that Θ will lie between the limits $\Theta \pm E$.

An ample numerical investigation is made of all these quantities; they are tabulated, and they are compared with a theoretical scale of precision in the way well known to all who are familiar with the subject of probabilities. The result is, that not only has the mean direction of these mountain masses been accurately ascertained, but it is also made clear that the direction in question is more than a mean direction—that it is a typical one. In other words, we have a direct numerical value (and it is in this case a large one) for the probability that the directions of the different mountains forming this group are due to a single cause, and not to many independent causes; and, consequently, the geologist and the physical philosopher will have good grounds to go upon in seeking some common agency which has caused their upheaval.

"In this way the calculus of probabilities, though one of the most abstract and refined branches of mathematics, and in itself incapable of interpreting any natural phenomena, may still serve as a check and a guide to the physical philosopher, by pointing out where he may and where he may not employ his study of causes, with reasonable hope of a successful result."

The CHAIRMAN, in returning the thanks of the Society to Mr. Spottiswoode for his communication, said this subject of the direction of mountain chains had for a considerable period given rise to discussions among geologists, and had formed a subject to which M. Elie de Beaumont in France had given his most mature consideration.

GENERAL J. E. PORTLOCK, R.E., F.R.G.S., said he would only offer a few words on a subject so complicated to point out the value of such researches. Everybody is now aware that the earth is not in the condition in which it proceeded from the hands of the Creator. The mountains were not originally in the position or under the circumstances in which we now saw them, but they have been lifted up to their present position. It naturally occurs to us to inquire how this work had been performed? Was there a regular progression in it, was it done all at once, or was it done in successive epochs? This is a point which has engaged the attention of geologists for many years past. M. Elie de Beaumont has particularly made it the object of his inquiries, and has established that there were at least twelve successive epochs of disturbances, or of elevation, each of which produced some evidence of the direction of its action on the surface of the earth. Now, an inquiry, such as Mr. Spottiswoode has entered upon, will, by the aid of high mathematical analysis, lead us to this kind of conclusion. We are looking at a range of mountains; we examine not merely their present direction, but their magnitude and weight. We consider, therefore, each range in its length, its height, and consequently its magnitude and weight, and by the calculus of probability we arrive at the conclusion that such particular line exhibits the direction in which the greatest amount of force had been applied; and that is assumed as the *typical* direction, or the direction in which nature had applied an elevatory force in the greatest and most general way. Of course, there will be diverging lines: on one side diverging in the one direction, and on the other diverging in the opposite; but these balance each other, and we arrive at a typical direction, which is not merely the mean as referred to direction alone, as was the case in the investigations referred to by Mr. Spottiswoode, but a result in which the weight of each part is taken into consideration as a necessary element in determining the direction and magnitude of the force which had been applied to the elevation of the chain. This, of course, is a most valuable elementary result as a guide to the physical inquirer in his researches, when endeavouring to bring positive facts under the domain of some definite law, and on this ground General Portlock looks upon every application of mathematical science to natural questions to be of the very utmost importance.

The CHAIRMAN, before adjourning the meeting, called attention to a series of beautiful illustrations of Texas and Mexico, which had been exhibited to the Society by the Abbé Domenech, who was about to publish in this country a work on that region, which would soon appear. The Abbé Domenech had spent six years in those countries, and he (the Chairman) was persuaded, from what he had heard from his contemporaries in France, and particularly from missionaries, that no person could be more thoroughly relied upon or more completely enabled to delineate the features of the tract he had explored.

Eleventh Meeting, May 14th, 1860.

THE EARL DE GREY AND RIPON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Rouland F. Jermyn ; Thomas Michell ; and B. Coulson Robinson, Esqrs., were presented upon their election.*

ELECTIONS.—*Colonel James Molyneux Caulfield ; the Rev. J. W. Clarke ; Captain J. A. Grant ; Lieut.-Colonel Edward Mackirdy ; Lieut. Everard Milman ; Captain Moncrieffe ; Captain John Pook ; Alfred Denison ; Edward M. Elderton ; Thomas Fraser ; Henry Kendall ; Augustus Henry Smith ; John Templeton ; and Robert Walker, M.D., Esqrs., were elected Fellows.*

ACCESSIONS.—Among the donations to the Library and Map-Rooms since the former meeting were—the continuation of the Ordnance Maps of Scotland ; Sheets of Blackie and Dufour's Atlases ; Plan of Smyrna and Aden Railway ; Hughes's Manual of Geography, &c.

EXHIBITIONS.—Photographs of Nazareth, Jerusalem, and Baalbec ; Dr. Beke's Plan of Port Louis and its Environs ; and Models of Boats used by the Greenlanders, with various Articles of Dress, were exhibited.

The PRESIDENT said the two papers to be read were both connected with Arctic subjects, and probably it would be most convenient to the Society that they should be read in succession before any discussion took place. He would now call upon Dr. Shaw to read the first, by Mr. Alderman Hopkins.

The Papers read were—

1. *On a Possible Passage to the North Pole.* By THOS. HOPKINS, Esq., Alderman, Manchester.

MR. HOPKINS bases his arguments upon the remarkable bend to the northward made by the isothermal lines of high latitudes between the meridians of Iceland and Spitzbergen. He recapitulates the experience of Parry, and expresses his belief that the seven degrees of latitude, or 420 miles, by which that navigator was separated from the Pole, might now be successfully traversed with the aid of steam.

MR. Hopkins's Paper is largely occupied with deductions from analogies of streams and aerial currents in other parts of the globe, confirming the conclusions suggested by the peculiar course of the isothermal lines mentioned above.

The PRESIDENT next called upon the author to read the second paper upon the proposed telegraphic communication with America by the Farøe Islands, Iceland, and Greenland.

The second Paper read was—

2. *Communication with America, viâ the Faröes, Iceland, and Greenland.*

By COLONEL T. P. SHAFFNER, U.S.

THE North Atlantic Telegraph, which has been struggling against formidable rivalry for some years past, is now rapidly assuming a form and proportion commensurate with the grandeur of the enterprise. The route preliminarily proposed for this project is as follows, viz., first from the North of Scotland to the Bay of Thorshaven, Stromöe Isle, of the Faröe Isles. The length of the cable for this section will be about 250 miles. The next section will run from Westermanshaven, of the same Isle, to about Portland, South Iceland, a distance of about 350 miles. From this landing the line will be constructed across Iceland to Reikiavik. From the Bay of Reikiavik the next section of cable will be run to some bay on the east coast of Greenland, south of latitude 61° north. This distance will be about 550 or 600 miles. It is proposed to run the line across the southern end of Greenland. The fourth section of cable will be run from one of the bays of the west coast, south of the latitude 61° north, to Hamilton's Inlet, on the Labrador coast, a distance of about 600 miles. The aggregate submarine telegraph will be about 1750 miles; land lines about 300 miles; total, some 2050; about the same length as the Atlantic cable from Ireland to Newfoundland.

The Danish Concession.—The concession for this telegraph has been granted by His Majesty the King of Denmark so far as it may occupy Danish territory. There is no monopoly of the line reserved to the Danish Government, but its impartial use is guaranteed to the whole world. The Government has pledged itself to "bestow all necessary care, vigilance, and means which may be within its command to insure the free, impartial, and unhindered use of the said telegraph line." If, however, the British Government should desire a wire for the transmission of its own despatches, a franchise can be given to it, and the use of that franchise will be defended by the Danish Government "with all the means within its command."

Telegraphic Manipulation.—There is no submarine telegraph line with an electrical circuit of 1,000 miles, nor have we any practical evidence that a circuit of that length can be worked for commercial purposes. It might be possible to organise a cable to work with some facility on a submarine circuit of that length, but to what extent would be its commerciality remains an unsolved problem. The longest subaqueous circuit now operated is about 750 miles, and the speed of transmission thereon is some seven words per minute.

On an air line of that length the transmission would be instantaneous, and on such lines the art of telegraphy is but a question of mechanism. On a telegraph line constructed through the air, perfectly insulated, and traversing an even and favourable temperature, a thousand words can be transmitted in one minute by the aid of mechanism. The ordinary manipulation, however, is with the hand, by the opening and closing of a given metallic circuit charged with electricity. The maximum transmission in this manner may be considered at about forty words per minute. The speed of transmission of the electric force through submarine cables depends upon the conductivity of the metal, its insulation, and length of circuit. I have good authority for saying that experiments, instituted in England with No. 16 copper wire, have proved that the electric current requires one-third of a second for the first 500 miles, and one second for 1000 miles. According to this progression, the time required to transmit an electrical impulse 2000 miles would be about nine seconds. This delay or hindrance is called "retardation." The cable becomes a Leyden jar, and the current transmitted is, more or less, held in suspension until discharged by some contrivance. It is owing to this suspension or retardation, and the irregularity of its time, that long submarine telegraphs cannot be made effective for commercial purposes.

Circuits of the Northern Route.—The electric circuits of the North Atlantic telegraph will be short—the longest about 600 miles, and cables can be laid capable of transmitting at least twenty words per minute. It will be a financial question that will determine the capacity of the cables for the commercial telegraphy. Between Scotland and the Faröes, and between the Faröes and Iceland, cables can be laid that can equal the working of a double line of cables across the other sections of the route, or perhaps it may be found best to construct them for the short sections with two wires for telegraphing, and on the other sections with three or more conducting wires. If either one of the sections fail, the whole are not lost, and another cable can be promptly submerged.

The Seas.—The depths of the seas are but little known. A few soundings were taken on the route last autumn. The water between Scotland and the Faröe Islands, and thence to Iceland, is not very deep, not exceeding, perhaps, 1000 fathoms, and there can be no doubt but that the bottom is very deep mud. The soundings taken last fall between Iceland and Greenland proved the bottom in that sea to be deep mud. The greatest depth of water was 1540 fathoms. The mud brought from the bottom has been examined by Professor Ehrenberg, of Berlin, and he says that he found

it "to contain numerous shells with life-being forms therein, which, in his opinion, exist alive at the bottom of the sea." With regard to the sand contained in the specimens, he says that "it is no rolling sand, but fragmentary, broken, and dissolved stones of mountains. The granules are not round, but with acute sides. The granite sand consists of much glimmer and quartz, with green crystal fragments, which might be hornblende were there particles of pumice-stone, but which are not at all therein to be found." From the evidence which we have in the premises, it would seem that the bottom of the sea gradually descends to 1540 fathoms from Iceland, and then in the same manner ascends to the Greenland coast. To determine the correctness of this opinion, farther soundings are required. The Arctic current, perhaps some thirty feet deep, and by some supposed to be fifty miles wide, carries with it large quantities of ice, from which earth drops to the bottom of the sea. The sea between Greenland and Labrador was also partially sounded by me last fall, and the greatest depth was found to be 2090 fathoms, which was about under the Arctic current, west of Greenland, latitude $61^{\circ} 05'$. North-west of this sounding the deepest water found was 1840 fathoms. The bottom in Davis Strait was soft mud, except under the Arctic current, where it was coarse sand, which had been evidently dropped from the ice. On many icebergs may be seen large quantities of sand and boulders of several inches in diameter.

Landings for the Cables.—The precise places for the landings of the cables have not yet been determined upon. There are good bays on North Scotland, and there need not be any fears as to that part of the route. The bay of Thorshaven, island of Stromöe, of the Faröe group, is approached from the deep sea without obstruction, and its bottom is sand. The average depth of water in the bay is about 20 fathoms. Thorshaven is the capital of the Faröe Islands, and has about 900 inhabitants. The cable to Iceland will leave Westermanshaven on the west coast of the Stromöe Isle. The bay is deep, bottom sand, and free from the ocean waves. On the south coast of Iceland, about long. 19° w., or at Portland, it is proposed to land the cable. The bottom of the sea approaching nearly the whole south coast of Iceland is sand. The coast is free from ice winter and summer. The cable to Greenland will run from the Rejkiavik bay. The depth of water in this bay is favourable, the bottom is mud and sand. It is free from ice winter and summer, excepting a little crust near the shore. Arctic ice is never seen in that bay, except, perhaps, once in a century. Rejkiavik is the capital of Iceland, and its inhabitants have the highest degree of education.

The landing places on Greenland require to be selected with great care, and after much investigation. It is proposed to land on the east coast, in one of the many bays south of latitude 61° north, and on the west coast near the town of Julianshaab, or south of that place, connecting the two with a line across Greenland. The bays penetrate to the interior ten, twenty, or thirty miles, and some of them never freeze, nor does the ice from the sea go up them but a few miles. They are very deep, and bergs never ground in them; the bottoms are of mud and sand. The characters of the bays on the two coasts are much the same, and the Arctic current does not approach the coast on either side. From the sea into these bays the water is deep far below the reach of the greatest icebergs. To make the selection of the proper bays for the landings of the cables the fullest information as to the depth of water from the sea will be required. Some of the inlets bring out ice, but the most of them do not; many of them are ten miles wide. As to Labrador, Hamilton's Inlet affords all the desired advantages. This inlet runs interior about 140 miles, and at its mouth it is thirty miles wide. The water is deep, and the bottom is sand. At its mouth there is a deep trench to sea, and a cable laid in that trench would never be disturbed by the sea. Above and below the mouth of Hamilton's Inlet there are shoals or reefs, some thirty miles from the coast, and many icebergs ground on them. After they melt or break to pieces they pass over and beyond the mouth of the inlet. They never ground at the mouth, nor do they enter into the inlet.

Icebergs.—The landings on the Farøe Islands and Iceland will never be disturbed by ice. They are open ports, and vessels can go and come from them at all seasons of the year. The coasts of Greenland and Labrador are beset with much ice. The east coast of Greenland is but little settled. The inhabitants trade with the colony near Cape Farewell, and they go and return from time to time in their skin boats. The Arctic or Spitzbergen current, with the floe ice, does not approach the coast, and much of the time that the floe ice runs between Greenland and Iceland the water near the coast is free from ice. The floe ice on the east coast may be seen in more or less quantities in the months of February, March, April, May, and a part of June. Sometimes it appears in the last days of January, and occasionally disappears in May. The coast or berg ice may be seen occasionally throughout the year. On the east coast neither the berg nor the floe ice penetrates the bays, and a cable laid therein would never be disturbed by them even were the waters shallow. The hills on the coast are covered with grass and berry bushes. The climate is not severe. The native ice is not

very thick; and if it were, the cable could not be injured by it. The west coast in Julianshaab district is settled by some 3000 Esquimaux and Danes. Their houses are to be found on many of the hills, and the skin boats are to be seen at nearly all times in some of the bays. The floe ice runs northward a few miles from the coast during the months that it is seen on the east coast. Between the green hills and the floe the sea is open and free from ice, except, perhaps, here and there a berg may be seen. Icebergs from Baffin Bay, or the various "blinks" more northward, will be found scattered along the coast. Some ground on the reefs or shoals, some are blown into the bays, and others pass off to the south. Those blown into many of the bays seldom, if ever, get out. If the bays have currents from the interior, they are taken out to sea; but if their waters be quiet, as many of them are, the bergs are blown to the land and ground. There they remain until the winds, the sun, and the tidal waves crumble them to pieces. Between the Arctic current and the coast many of the icebergs remain for weeks, and, in fact, until broken to pieces and melted. The largest iceberg may be some eighty feet above water; but as to their depth in the water, no one knows, nor is it possible to ascertain. The theory as to the specific gravity of ice cannot be applied to determine the depth of any given berg. The ice above water may be the cone ascending from a very broad base. In most cases very high bergs are very wide below water, and when the base becomes reduced the berg falls, and a new projection is seen from the water. The crumbling of bergs, and the changing of their positions, are to be seen going on at nearly all times. A rough sea soon exposes the form and size of the berg, and a careful judgment can determine the probable bulk. The bergs on the Labrador coast are of the same kind as those on the Greenland coast. They go south in great quantities until checked by the eddy currents on the east coast of Newfoundland. Many of them enter the bays of Newfoundland, and a cable laid therein will be more liable to be injured by the ice than those laid on the Greenland or Labrador coasts.

The North Atlantic Telegraph is an enterprise practically complete in all its parts, so far as pertains to demonstrated philosophy. In its construction and subsequent operation there will be nothing to discover, nothing to invent; but we have only to follow the sciences and arts as effective, at this time, in commercial telegraphy, and our efforts will be crowned with a success that will add new glory to the age in which we live.

The PRESIDENT said the first paper propounded a very ingenious theory upon which, as it involved many complicated scientific question

undertake to pronounce any positive opinion; but he trusted there might be some gentlemen present who, from their acquaintance with the Arctic regions, would be competent to speak upon the questions submitted to them. They were especially obliged to Mr. Alderman Hopkins for coming from Manchester to give to them the results of his researches and inquiries. With regard to the other paper, it was also a subject of congratulation when gentlemen from foreign countries were kind enough to come and submit their investigations to the Society. Every scheme which tended to unite this country with America, and to facilitate intercourse between them, would always be hailed with the greatest satisfaction. But in the case of the present proposals the first thing required was that the whole line proposed to be traversed by the electric wires should be carefully examined and surveyed, and that the route which ultimately proved to be the best should be adopted. Such an investigation would have a peculiar interest for geographers, relating as it did to the physical formation of a hitherto unexplored portion of the earth.

MR. LIONEL GIBBORNE, F.R.G.S., thought the two papers were contradictory to one another. Mr. Hopkins tried to prove that in the polar region there was a warm latitude which might be reached by shipping. Colonel Shaffner tried to prove that between Scotland, Farøe Islands, Iceland, and Greenland, there was also a warm latitude, or such a latitude that a telegraphic cable might be laid without being troubled by icebergs. He should confine himself to the geographical portion of the question. Colonel Shaffner had omitted one most important element in the consideration of the question, and that was the effect of terrestrial magnetism upon the telegraph. We knew from the experience of submarine lines that the difficulty of making an instrument delicate enough to record a signal at a long distance was chiefly caused by the amount of terrestrial magnetism to be overcome, the magnetism sometimes being induced by the telegraph itself. If terrestrial magnetism in the polar regions was far greater than in the latitude of the old Atlantic line, he thought it would be found a most important objection; therefore, should any survey be made, that was a point which ought to be urged upon investigators. Apart from this probable difficulty, there were other questions to be investigated connected with the working of the line, principally the question of icebergs. He had the opinion that icebergs were prevalent about Iceland, Greenland, and Labrador; and if Colonel Shaffner could show that there were inlets and bays on the coast in which a cable could be landed safe from the effects of icebergs, he would have established a fact not generally known, and a most important fact in the physical geography of that country. Supposing these two points satisfactorily settled, then came the question of advantage: What advantage was there in the proposed route, when the two termini of the line would be such a long distance from the points wanted to be reached—London and New York? Taking a broad view of the question, he should not be disposed to go to a part of the world with such a delicate thing as electricity, where every book on the subject showed there were currents, great differences of temperature, icebergs, and changes in the formation of the country, to be encountered. The only advantage offered by Colonel Shaffner was that of having a fresh battery every 500 or 600 miles; that was an immense advantage; and if it could be proved that the difficulties to which he had referred did not exist, then, undoubtedly, the route proposed would have advantages not possessed by any other in that respect. Whatever opinion he might hold as to the feasibility of the plan, must be controlled by new facts, which a proper survey could alone establish.

MR. J. STUART WORTLEY, F.R.G.S., said the question of the proposed telegraph had several characters: its physical character, which more immediately came under the attention of a Society like that, its political character, its commercial character, and its electric character. The last three did not come within the province of the Society. With politics they had nothing to do; yet he would remind the meeting that Colonel Shaffner did not afford a British line,

nor even a British-American line. It would traverse Danish territory: at any time when European politics disturbed the relations of this country, the line itself might be disturbed. With regard to the commercial part of the question, Colonel Shaffner had omitted to state the expense of maintaining the numerous stations at the Faröe Islands, in Iceland and in Greenland. Upon the electrical part of the question he did not presume to touch: he was not an electrician, and that subject was far too difficult for him to deal with. It had been alluded to by Mr. Gisborne, and all that he would say was this, that it had been proved by experiments that it was possible to communicate by electricity 1900 miles. He held in his hand an American newspaper, containing five and a half columns of actual messages which were sent from this country to America by the Atlantic telegraph.

But with regard to the geographical question, Colonel Shaffner would be the first to admit that his examination of these seas was exceedingly cursory and imperfect, and unsatisfactory. It was most important that our Government should survey this line, as well as every other line suggested to cross the Atlantic. It was a national object to get the best line, and it was the duty of Government to assist commercial enterprise by first ascertaining that point. He thought Colonel Shaffner rather underrated the distance between Iceland and the point of Greenland which he mentioned: it was nearer 700 miles than 500. Nearly all authorities agreed in discouraging that particular line. It was new to hear that the east coast of Greenland was free from ice. In Norie's chart the whole of that coast was designated as an impenetrable field of ice; and he held in his hand the log of the vessel in which Colonel Shaffner sailed, and it was there stated that they were beset with ice at one time and lost all control of their vessel, and that at other places they saw thousands of icebergs. Enough had been learned to show that at all seasons of the year there would be considerable danger not only in navigating those seas, but also in laying a cable worth two or three hundred thousand pounds. Beyond that there were the Spitzbergen currents bearing down the east coast of Greenland, bringing with them ice, drift timber, and all sorts of wreck, which in itself would be a discouraging circumstance to anybody laying a cable in those seas.

DR. HODGKIN, F.R.G.S., thought that after the failure of the Atlantic cable, which had caused such general regret, we were much indebted to Colonel Shaffner for proposing a means of overcoming the difficulty. The objections which had now been urged were based upon supposition only, and ought not to turn aside inquiry. When in Pisa last year he had had the opportunity of conversing with that distinguished electrician Professor Matteucci, who, as director of the Tuscan Government's telegraphic establishment, had great experience. It was the Professor's opinion that there were electric difficulties in the way of transmission to so great a distance as across the Atlantic, with which we were not at present fully acquainted. These difficulties would be diminished by the Colonel's plan of breaking the distance, which had the additional advantage of reducing the amount of loss in case of the breaking of the cable. The risk from icebergs would only exist during the operation of laying down the cable, for when once laid down in deep water it would be below the reach of the largest icebergs. In shallow water near the shore it might be injured by them; but from the description given of these coasts it was pretty certain that favourable places might be selected where, from the depth of the sea close to the shore, even this risk would be small. He further observed that the proposed line of cable kept clear of the eastern shore of Greenland, which, like other eastern shores in those regions, had been shown to be the most blocked by ice.

SIR EDWARD BELCHER, F.R.G.S., said it would be impossible to navigate the Polar Seas in the winter months. Steam was entirely out of the question, and sailing vessels would be entirely at the mercy of drifting ice. With respect to the feasibility of telegraphic communication, he was not disposed to rest upon the *ipse dixit* of any man who had not been on the ground.

rely solely on experiment. For instance, it had been asserted by the most eminent navigators that at Point Venus, Tahiti, it was invariably high water at noon. Close observations for six weeks proved this to be utterly untrue, for the tide ranged from 9-30 A.M. to 2-30 P.M.; and in the present case he entirely disagreed with the impression that ice was so prevalent on the eastern coast of Greenland. The Arctic expedition, which left the Orkneys in the month of May, 1852, never met with an iceberg until it nearly sighted Cape Farewell; and Captain Allen Young, when in a Greenland port, seeing the ice moving at what was considered to be a rapid rate, measured the rate of progression with a theodolite, and found it was about one mile in twenty-four hours. Another traveller (Scoresby, I think), who went all along that coast, stated in conversation at the meeting of the British Association at Swansea that, "when one of these bergs calved or split off from the land, it went down absolutely under water, then rose and floated off:" consequently there was good reason to calculate on deep water there, and a cable could be run up to the side of a precipice at a depth where it would be safe from icebergs, and then carried over or along the base of the precipice. On the banks of Newfoundland he measured a pinnacle iceberg, and it was found to be 150 feet high; in a short time it turned over, and was then not more than 80 feet above water. Icebergs were very different from floe ice. Floe ice seldom exceeded three or four feet in thickness in the flocs they docked in during their progress in Davis Strait: it was salt-water ice, and was about eleven-twelfths immersed. The iceberg is a fresh-water formation, and derives its formation from the thawing snow trickling over the side of a mountain. This gradually freezes until the accumulated mass becomes too heavy to be retained by cohesion; it then, as it is termed, "calves" or breaks off and falls into the sea. It was generally supposed to be nine-tenths immersed, by authorities who vary considerably. It has been stated that somewhere about the mouth of Davis Strait, on the Labrador shore, a barrier existed, upon which icebergs ground, and thus deflect the drift of the pack off the land of Labrador, and after passing about 200 miles westerly of the straits of Belleisle, they again turn in about St. John, Newfoundland, which harbour they frequently blocked. Government, he thought, ought to examine into this question relative to deep sea soundings or banks adapted for fishing, &c. We want the facts as to the true nature of the bottom determined before any attempt was made to lay a cable.

COLONEL SHAFFNER said he had the evidence of the Government of Iceland that ice did not exist there. The question of terrestrial magnetism was deserving of investigation. With regard to the alleged log which Mr. Stuart Wortley had mentioned, he had in his own possession the entire log made by the first mate, and it certainly contained no information as to the vessel having been beset with ice.

MR. ALDERMAN HOPKINS said it seemed to be assumed by one gentleman that he proposed to attempt the passage to the North Pole in the winter. He certainly had no such intention, and he did not think his language bore that construction. He alluded to the state of things in the winter merely to show that there were some extraordinary causes in operation at that season of the year; but he then went on to show that in the summer circumstances were of such a character as to afford a reasonable expectation that with proper means the attempt to reach the Pole might be made with success.

The PRESIDENT congratulated the meeting upon the interesting character of the discussion, and expressed a confident hope that much geographical knowledge and advantage would be derived from a farther investigation of both the questions which had been brought forward. As Mr. Wortley had ventured to touch upon politics, perhaps the meeting would permit him to say that they were very much obliged to the Danish Government for encouraging an enterprise of this description, and that, if it were carried out, it would tend to cement the friendly intercourse and union which existed between the two countries.

PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY
OF LONDON.

SESSION 1859-60.

Twelfth Meeting (ANNIVERSARY), 1 P.M., *May 28th*, 1860.

The EARL DE GREY AND RIPON, PRESIDENT, in the Chair.

THE Minutes of the previous Meeting having been read and confirmed, the regulations respecting the Anniversary Meetings were next read, when the President appointed William Bollaert and John Hogg, Esqrs., Scrutineers for the Ballot.

The Reverends R. Miles and J. J. Stewart Perowne; Professor Henry Darwin Rogers; the Earl of Southesk; and James Brown, M.P.; William Henry Cooke; George Elliot, C.E.; and Frederick Haworth, Esqrs., were proposed as Candidates for election at the next Meeting.

The Report of the Council, with the Balance Sheet for 1859 and the Estimate for 1860, was then read and adopted.

The CHARTER and REGULATIONS of the Society, as revised by the Special Committee and submitted by the Council, were adopted.

The President next delivered the Founder's Gold Medal to Sir Roderick I. Murchison, on behalf of Lady Franklin, in commemoration of the Arctic Researches of the late Sir John Franklin, and in testimony of the fact that this expedition was the first to discover a North-West passage; also in token of admiration for her perseverance in sending out expeditions to ascertain the fate of her husband and the ships under his command.

The Patron's or Victoria Gold Medal was delivered to Captain Sir F. Leopold M'Clintock, R.N., for the skill and fortitude displayed by him and his companions—Hobson, Young, and Walker—in their search for records of the lost expedition, and for their valuable coast surveys, by which our acquaintance with the Arctic geography has been enlarged.

The President then read his Anniversary Address, for which a unanimous Vote of Thanks was passed, with a request that he would allow it to be printed.

At the conclusion of the Ballot, the Scrutineers reported that the changes advised by the Council had been adopted; the Earl de Grey and Ripon, retiring from the Presidency, to be succeeded by Lord Ashburton; and the vacancy among the Vice-Presidents, occasioned by the retirement of Colonel W. H. Sykes, to be supplied by Earl de Grey. The vacancy in the Trustees, caused by the decease of Sir George T. Staunton, Bart., to be filled by Sir Walter C. Trevelyan, Bart.; and those among the Ordinary Councillors, occasioned by the retirement of Capt. the Hon. J. Denman, R.N.; Colonel Sir Henry James, R.E.; General E. Sabine, R.A.; the Earl of Sheffield; Thomas Staveley; Count P. E. de Strzelecki; and by the decease of Robert Stephenson, M.P.; to be filled by Lieut-General C. R. Fox; Capt. W. H. Hall, R.N.; A. J. B. Hope; Austen H. Layard; William Spottiswoode; Colonel W. H. Sykes; and Viscount Strangford.

Thanks having been voted to the President, Vice-President, Members of Council, and Scrutineers, the President finally directed attention to the usual Anniversary Dinner, and the Meeting adjourned.

PRESENTATION
OF THE
GOLD MEDALS

TO LADY FRANKLIN AND TO CAPTAIN SIR F. L. M'CLINTOCK.

THE President, the EARL DE GREY AND RUPON, read the following statements explanatory of the grounds on which the Council had awarded the Royal Medals respectively :—

Desirous of commemorating in an especial manner the Arctic researches of our associate the late Sir John Franklin, and of testifying to the fact that his expedition was the first to discover a North-West Passage, the Council of the Royal Geographical Society, have awarded the Founder's Gold Medal to his widow, Lady Franklin, in token of their admiration of her noble and self-sacrificing perseverance in sending out, at her own cost, several searching expeditions, until at length the fate of her husband has been finally ascertained.

The Council has farther adjudicated the Patron's Gold Medal to Captain Sir F. L. M'Clintock, R.N., for the consummate skill and unflinching fortitude with which, in the *Fox* yacht, he and his gallant companions have not only enlarged our acquaintance with Arctic geography, but have also brought to light the precious "Record" which has revealed to us the voyage and final abandonment of the *Erebus* and *Terror*.

In making these awards, it is but right to recall attention to some of the leading facts connected with this subject.

Having already taken part in two of Nelson's glorious victories and in other battles of the old war, Sir John Franklin began his Arctic explorations in the years 1818 to 1822, and subsequently, by his researches in 1825 to 1827, he had already acquired a renown second only to that of Parry. Aspiring, however, to the supreme object of his ambition—the discovery of a North-West Passage—he again left our shores in 1845 to accomplish that great mission.

In ascertaining the date and place of the death of Franklin, M'Clintock and his companions have also effected several important geographical discoveries. Lands and seas which had hitherto been entirely unknown to geography have by their energy and ability been laid open.

Owing thus to the devotion of Lady Franklin and the skill of Captain M'Clintock, it is now demonstrated that the *Erebus* and *Terror* ascended Wellington Channel to the 77° of north latitude, that the two ships were navigated round Cornwallis Land, which was thus proved to be an island; and that finally, steering from Beechey Island to the south-west, they were, on the 12th of September, 1846, beset in the ice, in which they wintered in latitude N. $70^{\circ} 5'$ and longitude W. $98^{\circ} 23'$, having reached a position never before or since attained by any other ship.

In placing the *Erebus* and *Terror*, in 1846, in this position, it is clear that the Franklin expedition, whose commander, with others,* had previously ascertained the existence of a channel along the North coast of America, with which the frozen sea, wherein he was beset, had a direct communication, had thus, in a geographical sense, firmly established the existence of a North-West Passage.

Having by this great feat rendered his name illustrious, the Council deem it to be an act of justice that as Ross, Back, Simpson, Rae, Inglefield, M'Clure, Kane, and Collinson have each been rewarded by a Medal of this Society for their distinguished Arctic researches, so the list of such worthies cannot be more appropriately enriched than by offering the Patron's Medal of the year to the consecration of the deeds of *Franklin*.

In so doing the Council have indeed a peculiar satisfaction in awarding this Medal to the relict of the great navigator, in admiration of the single-minded and undaunted energy which animated her endeavours, and which have terminated in clearly ascertaining that, in sacrificing their lives, Franklin and his brave companions died in solving the long-sought geographical problem.

The Council therefore hope that Lady Franklin will consider the Gold Medal now awarded to her not only as the merited recompense of her husband's discoveries, but will also accept it as a testimony of the admiration entertained by British geographers for her who has devoted the last twelve years of her life to this glorious object, in accomplishing which she has sacrificed so large a portion of her worldly means.

* Beechey, Hearne, Mackenzie, Richardson, &c.

But all the devotion of a Lady Franklin and the efforts of the British nation might well have failed in unravelling the fate of the *Erebus* and *Terror*, had not such a commander been selected for the *Fox* as Captain Sir F. L. M'Clintock.

Inured by previous explorations to the risks and dangers of Arctic life, this brave officer has so modestly and clearly told his stirring tale of how in a yacht of 170 tons he successfully worked out his great mission that he has already enlisted the sympathies of Europe and America.

He has also imperishably chronicled in the exploits of the expedition the names of his worthy associates Hobson, Young, Walker, and Petersen, in a work which will doubtless endure as long as men shall continue to revere the deeds of such persevering and skilful explorers.

Of the events in this narrative there is no one which has drawn forth more commendation than the calm resolve with which the gallant commander, after having been driven back 1200 miles in the "pack," and carried out into the Atlantic, returned to combat with the obstacles of frozen seas, and, nothing disheartened, steered back his little yacht once more into Baffin Bay.

Marking the judgment and sagacity he showed throughout the whole of an expedition which terminated in making known the extent of the discoveries of Franklin, as well as the place and date of his death and the almost certain fate of those gallant companions, Crozier, Fitzjames, and others who survived him, the Council have the satisfaction of recording that the commander and officers of the *Fox* have also added vastly to geographical knowledge.

In proving that Bellot Strait is navigable, they have demonstrated that its southern shore really constitutes the most northern promontory of North America, in rounding which and in sledging along the western shores of Boothia M'Clintock has given us reason to believe that, in some favourable season, the passage, even by a ship, may possibly be effected from Baffin Bay into the long and tortuous channel which Collinson so recently navigated.

Again, while the researches of Lieutenant, now Commander, Hobson not only delineated for the first time the western shores of King William Island, but were signalised by the detection of the precious "Record" of the discoveries and last days of Franklin, with many relics, the indefatigable journeys of the gallant and generous volunteer Captain Allen Young have not only determined the outlines of a large portion of Prince of Wales Island, hitherto

entirely unvisited, but have gone far to satisfy geographers that the ice-choked channel to which the name of M'Clintock has been attached, rarely, if ever, offers a free passage for ships.

For these successful results, obtained with very slender means and under the severest trials, the Patron's Medal is bestowed on the leader of this last expedition, whose services have already received the warm approbation of his Sovereign and his country, and who will doubtless rejoice in knowing that he is on this occasion the recipient of the same honour as that which is adjudged to the noble-minded widow of Franklin.

The President then handed the Founder's Gold Medal to Sir Roderick I. Murchison, who, on behalf of Lady Franklin, replied—

“Connected as I have been with the Royal Geographical Society since its foundation, I can assure you, my Lord, that no event relating to our body has given me greater satisfaction than the unanimous and hearty acquiescence of the Council in the proposal which I made to them to grant our Founder's Medal to Lady Franklin.

“Having presided over the geographers fifteen years ago, when my dear friend Franklin last left our shores, it naturally became me, in the following years, when we began to be anxious about the fate of the *Erebus* and *Terror*, that I should advocate every search, both public and private, which might throw a light upon the voyage of those vessels; and I have thus had abundant opportunities of observing and testing the sterling qualities of a woman who has proved herself to be worthy of the admiration of mankind.

“Undaunted by failure after failure, through twelve long years of hope deferred did she persevere with a singleness of purpose and a sincere devotion which are truly unparalleled; and now that her own last expedition of the *Fox*, under the gallant M'Clintock, has realized the great facts that her husband had traversed wide seas unknown to all former navigators, and died in discovering a North-West Passage, then surely the adjudication to her of this Medal will be hailed by the nation, as well as by this Society, as one of the many recompenses to which the widow of the illustrious Franklin is eminently entitled.

“Lady Franklin's gratitude for this the highest testimonial we can offer, is thus feelingly expressed in a letter to myself, the only drawback to my reading of which is that she dwells too much on my poor though zealous services.

“‘5, Park Place, St. James's,
May 24th, 1860.

“‘MY DEAR SIR RODERICK,

“‘As you were the first to communicate the great honour which has been conferred upon me by the Council of the Royal Geographical Society, and as I know you were the first to make the suggestion which was kindly and unanimously accepted by the Council, I am sure you will do me the farther favour of returning my heartfelt thanks to them.

“To no one could I make this request more fitly, as it seems to me, and with more confidence, than to the faithful friend of my dear husband and myself, who, during many long years, has made the cause of the lost crews of the *Erebus* and *Terror* his own, and to whose untiring and enlightened energy, exerted in behalf of our latest, and, as it were, dying effort, the little expedition of the *Fox* has been so conspicuously indebted.

“In giving expression to my natural feelings on receiving this precious Medal, you will feel assured that its chief value to me is the recognition by the most competent authorities, which it testifies to, of the life-long services of my husband in the cause of geographical research, and especially of the crowning discovery of the North-West Passage by himself and his companions, which cost them their lives.

“In the contemplation of so just and so generous an act towards the dead, all personal considerations are well-nigh absorbed, yet not so entirely but that I feel deeply the great and exceptional kindness of which I have myself become the object. Disclaiming, as I must ever do, all merit for efforts which originated in the natural impulses of love and duty, and which never could have been successful without the steadfast help of all those who upheld and served me so well, I shall not the less cherish, with great pride as well as gratitude, the touching and distinguished proof so generously accorded to me of the approbation and sympathy of the Royal Geographical Society.

“Believe me, dear Sir Roderick, sincerely and gratefully yours,

“JANE FRANKLIN.

“*Sir Roderick Murchison, Vice-President of the Royal Geographical Society, &c.*”

“Breathing as this letter does the fulness of a grateful woman’s heart, yet does it not give full vent to all those feelings by which Lady Franklin is animated. She has, indeed, enjoined me to say that the honour conferred upon her is vastly enhanced by knowing that she only shares in that approbation of the Geographical Society which has been and is so warmly bestowed upon Captain Sir Leopold M’Clintock and his gallant associates.

“A still more deeply-seated sentiment, however (as yet ungratified), is implanted in the breast of the widow of Franklin—a sentiment which was no sooner broached in the House of Commons by Sir Francis Baring than it met with general applause, and elicited the commendation of the Prime Minister and of eloquent speakers on both sides—namely, that setting aside all pecuniary reimbursement for that large expenditure of money which she could ill afford, she hopes that the Parliament will be thus far generous as to reward the officers and crew of the *Fox*, and provide for the erection of a monument to the memory of her husband and his companions in a public place, on which shall be recorded that they died in being the first to discover a North-West Passage.

“Let then our gift of the Gold Medal, solemnly and unanimously conferred by us on Lady Franklin for her devotion in her husband’s cause, be followed up both by a suitable grant to the brave officers and crew of the *Fox* and by raising a monument to Franklin in Trafalgar Square, so that his earliest services under the immortal Nelson may be blended with the nation’s recognition of his Arctic fame.

"To the honour of France, her lost and lamented navigator La Perouse has his monument and trophies in the Louvre. Let England, then, also evince her gratitude to Franklin and his companions by a durable public memorial in bronze, and thus show that she not less truly honours those who die in so nobly serving their country."

The President, in presenting the Patron's Medal to Captain Sir F. L. M'Clintock, said :—

"It affords me sincere gratification to be the medium of conveying to you, Captain M'Clintock, this, one of the two highest rewards the Geographical Society can confer; and in recognising the great services you have performed, I may be permitted to say that the value of those services to the cause of geographical science is appreciated throughout the civilised world."

Sir F. L. M'Clintock replied—

"I assure you, my Lord, it is with deeply grateful feelings that I receive this proof of the estimation which the Royal Geographical Society places upon my humble services. You are aware that the discoveries which have gained for me this honourable distinction were made incidentally, while following up anxiously a widely different purpose; and I regard it as an additional proof of the liberality of the Council that they have, notwithstanding this circumstance, conferred upon me this valuable token of their approval. I am sure you will believe me when I say that its value is in my mind largely enhanced by the fact of its being conferred in conjunction with a marked and feeling tribute paid to the memory of our great Arctic discoverer. This circumstance—the recognition of the last services of the lamented Franklin and his devoted companions, is a richer reward to me than any I could personally receive. Let me thank you, too, on behalf of my gallant and devoted companions, to whose assistance I was so largely indebted, and who will see in this honour which you have conferred upon me not only a reward for my humble efforts, but a pleasing acknowledgment of their services. It has not been my fate to be employed directly and exclusively on geographical discoveries, but I trust that this ample recompense for past will be an incentive to future exertions in the same course. We live in times of great change, and it is impossible for any one, especially in my profession, to say what may be his future destination; but it will afford me great pleasure if the offer of my services should be accepted hereafter to explore new regions, and extend the boundaries of our knowledge of the Arctic Seas."

A D D R E S S
TO THE
ROYAL GEOGRAPHICAL SOCIETY
OF LONDON;

Delivered at the Anniversary Meeting on the 28th May, 1860,

BY THE EARL DE GREY AND RIPON,
PRESIDENT.

OBITUARY.

IN accordance with our usual custom, I proceed to mention the losses by death which the Society has sustained since the last Anniversary.

Colonel George BAKER was one of the earliest associates of our Society, having been connected with it since the year 1830; and although, owing to the distance of his residence from London he was seldom enabled to share in our proceedings, there was a period in his earlier life when he distinguished himself by undertaking and carrying through, under many difficulties, a geographical work of no trifling importance at the time, and of which the value was highly appreciated, while it has never since been impugned.

As an officer of the 16th Light Dragoons, to which regiment he had been from his youth attached, he bore his part, under the Duke of Wellington, in the first operations of the Peninsular war; and although prevented from sharing in the triumphant conclusion of them by falling into the hands of the French during a cavalry skirmish after the battle of Salamanca, and being marched as a prisoner to Verdun, he joined his regiment again after the peace of 1814, was engaged at Waterloo, and accompanied the army afterwards to Paris.

Having subsequently devoted himself with much diligence to a cultivation of those branches of military study which were so efficiently encouraged and directed at that time by Sir Howard Douglas, in the College at Farnham, when it became necessary to define and map the boundary frontier between the empire of Turkey and the newly created kingdom of Greece, Colonel Baker was selected, in 1830, by the Earl of Aberdeen, who then held the seals of the Foreign Office, as the English Commissioner to whom the work was entrusted. Two other military officers were associated with him as the respective representatives of France and Russia, by whom, jointly with this country, the measure had been adopted; and a Greek and a Turkish officer were added afterwards to the Commission.

The obstacles which presented themselves to the first commencement of this operation, from the absence of any accurate geographical data on which it might with safety have been founded, and the obstructions afterwards interposed during the progress of it by the intrigues of the Turkish Government, requiring repeated remonstrances on the part of the Allied Commissioners, which were supported by our Minister at Constantinople—these were the difficulties that created a very serious delay before the work was finally completed. Nor was it until December, 1835, that the map was presented in its finished state to the Sultan.

It was based upon a trigonometrical survey of a narrow strip of country extending on each side of the boundary line, which, reaching from the Gulf of Arta at its western to that of Volo at its eastern extremity, included, with all its sinuosities, a distance of 137 miles; and it was defined by 95 landmarks, which, though mostly destroyed by the Turks in the winter of 1832, were restored in the following summer. The office devolved upon Colonel Baker of submitting to the Conference of the Allied Powers, during these protracted operations, a plan by which at length the objections raised by the Porte to the arrangement were overcome, and the measure was brought to a successful issue.

Colonel Baker maintained to the latest period of his valuable life, which closed at Bath in December, 1859, the same talent for military survey, and the same diligence in prosecuting it, which characterised him in his earlier career: for, having resided for a few weeks with his family during the last autumn at Torquay, he drew up an able report, accompanied with actual measurements, of the whole neighbouring coast, pointing out the weak and the strong points of

defence which it commands; and the report was transmitted to the Commissioners then recently appointed for inspecting the Defences of the Naval Arsenals and the Coasts of the country.

General Sir T. Makdougall BRISBANE, Bart., was the representative of a family of high antiquity and elevated position. After some preliminary education, partly at home and partly at the University of Edinburgh, young Brisbane was placed at an academy at Kensington, where he distinguished himself by his great proficiency, and showed the bent of his mind by attending the lectures of eminent professors, particularly on astronomy and mathematics. In 1789 an ensign's commission was procured for him, and in the following year he joined the 38th regiment, then stationed in Ireland, where he became acquainted with the Honourable Arthur Wellesley, who was then of similar rank; and the friendship thus commenced endured until the death of the Great Duke, more than sixty years after. In 1793 he proceeded to Flanders, and served through the campaigns of that and the following year, was wounded, and endured almost incredible hardships during the retreat of the British army. In a work entitled 'Reminiscences' (privately printed shortly before his death, and which contains many curious anecdotes of the Duke of Wellington), he says, "This was the severest winter I have ever seen in Europe. The troops were literally frozen to the ground every morning, and in one of those severe nights *eight hundred men were frozen to death*. . . . The Rhine was covered with a layer of ice 6 feet deep." In the October of the next year he was ordered to the West Indies, where he served with distinguished bravery under Sir R. Abercromby, Sir John Moore, Sir Thomas Picton, and other generals, at the capture of St. Lucia, Trinidad, and other islands. In 1799 his friends purchased a Lieutenant-Colonelcy for him in the 69th regiment, for the purpose of bringing him from the tropics, as his health had suffered greatly there. He accordingly came to England, but only to find that, contrary to expectation, the 69th had just sailed for Jamaica, which, after a few months at Cheltenham to recruit, he went out to join.

Colonel Brisbane, now for the first time in command, soon showed his aptitude for the situation. He endeavoured to improve the position of the army generally, by representing to the Commander in Chief the unhealthy position of the barracks throughout the West Indies, as being placed on the *leeward* instead of the *windward* side of the islands; but no notice was taken of his well-

meant endeavours, though his views have since received ample confirmation from the valuable 'Returns of Sickness and Mortality in the Colonies,' drawn up by Colonel Tulloch. Returning home, he was quartered in various parts of England until 1804, when the 69th was ordered to India; and as his health would not allow him to proceed thither, after trying in vain to exchange into the Guards or the cavalry, he was obliged to retire for a time on half-pay.

In 1810 Colonel Brisbane was appointed Adjutant-General at Canterbury, but he longed to join his old acquaintance, the Duke of Wellington, and, in consequence of his urgent applications, in 1812 he was made Brigadier-General, and proceeded to the Peninsula. There he was posted to the third division, commanded by his friend Sir Thomas Picton, and with it he served until the close of the war. Then he was sent to America, where he succeeded in causing the war on the Canadian frontier to be carried on according to the usages of civilized nations (which had not been the case before), and next served in France in the army of occupation. He had arrived in England just too late to share in the glories of Waterloo, but he was sent with twelve regiments to reinforce his old commander, who, when he inspected them at Paris, exclaimed, "*If I had had these men at Waterloo, I should have wanted no Prussians.*"

With the return of the army from France, in 1818, the services of Sir Thomas in the field came to a close. In 1819 he married Anna Maria, the heiress of Sir Henry Hay Makdougall, of Makers-toun, Roxburghshire, Bart., by whom he had two sons and two daughters, who all preceded him to the grave. In 1821, after holding for a short time the command of the troops in the south of Ireland, he was appointed Governor of New South Wales, where he found a wide field for the exercise of his active and benevolent mind. He introduced the culture of the vine, sugar-cane, cotton, tea, and tobacco; he imported horses, and thus so improved the breed that the colony can now supply cavalry horses for India; he did much to procure for it trial by jury and representative institutions, which it now enjoys. He encouraged, and liberally supported from his own means, all religious and charitable institutions; in his treatment of the convicts he abolished harassing and vexatious punishments, which he felt only irritated instead of reforming; and he first granted tickets-of-leave to the well-conducted, which gave a supply of much-needed labourers to the free colonists, the result of which was that at the close of his government, in 1826, the quantity of land under cultivation had been more than doubled,

while the expense of the convict establishment had been most materially reduced. On his quitting the government addresses of the most flattering nature were presented to him from all classes, and they were well deserved.

Sir Thomas now returned for the last time to his native land, and lived for more than thirty years as useful and as honoured as the man of science, and a public benefactor, as he had before been in his military and administrative capacity. He from his youth had cherished an ardent love for science, and a narrow escape from shipwreck had led him to become a practical astronomer. This was on his first voyage to the West Indies, when the ignorant master of the transport wandered out of his course on to the coast of Africa, and when he found his ship among the breakers, lost all heart and cried out, "Lord have mercy upon us, for we are all gone!" Young Brisbane, who was but two-and-twenty, replied, "That's all very well, but let us do everything we can to save the ship;" and, taking the command, he worked with his own hands until the vessel was placed in safety. This incident made a deep impression on him. "Reflecting," he says, "that I might often in the course of my life and services be exposed to similar errors, I determined to make myself acquainted with navigation and nautical astronomy; and for this purpose I got the best books and instruments, and in time became so well acquainted with these sciences, that when I was returning home I was enabled to work the ship's way; and having since crossed the tropics eleven times and circumnavigated the globe, I have found the greatest possible advantage from my knowledge of lunar observations and calculations of the longitude." This was shown in his voyage home from New South Wales, when he predicted the time of making Cape Frio, in Brazil, to within a few minutes, to the confusion of the captain, who, until day-break enabled him to see the land, believed himself at least 500 miles distant.

In order to pursue his astronomical studies, Colonel Brisbane, while he was on half-pay in 1808, had erected an observatory on a knoll, near the mansion house of Brisbane; and this in after years became his place of daily resort, beside often spending the night there. Whilst governor of New South Wales, he established an Observatory at Paramatta, which has rendered such services to science that it has been aptly styled "the Greenwich of the Southern Hemisphere;" and soon after his return to Scotland he formed another observatory at Makerstoun, to which he eventually

added a magnetic station, the only one in that country; and he showed great liberality alike in providing instruments, and in remunerating observers and printing the results of their labour. The clocks in the magnetic observatory cost upwards of 1200 guineas. He likewise assisted with his counsel and his purse many other establishments, as the Observatories of Edinburgh, Glasgow, and the Cape of Good Hope; and one of the latest acts of his life was to found two gold medals for the reward of scientific merit;—one for the Royal Society of Edinburgh, the other for the Society of Arts. The first of these was adjudged at Aberdeen, in September, 1859, to his fellow-countryman and former fellow-soldier, Sir Roderick I. Murchison. Such devotion to science did not pass unregarded. The Universities of Oxford and Cambridge conferred their degree of D.C.L.; while he was in New South Wales he was elected a Fellow of many learned Societies; and on the death of Sir Walter Scott he was chosen to succeed him as President of the Royal Society of Edinburgh. The gold medal of the Astronomical Society was awarded to him in 1828, and the address of the President (now Sir John Herschel) did but justice to him in saying that “the first brilliant trait of Australian history marks the era of his government, and that his name will be identified with the future glories of that colony, in ages yet to come, as the founder of her science.”

In 1836 he was created a Baronet; in 1837 named Knight Grand Cross of the Bath; in 1841 he became General, and at the period of his decease his was the third name on the Army List.

He died in the house in which he was born, on the 28th of January last, at the age of eighty-seven, and he is succeeded in the baronetcy by his nephew, the son of the late Admiral Brisbane.

Sir Thomas was a man of commanding appearance, more than six feet high, and with a handsome, intellectual expression of countenance. His name was on the Army List for a period of sixty-seven years, in the course of which he had fought in fourteen general actions, and twenty-three other battles, and had assisted in eight sieges. He had a gold cross and clasp for Vittoria, and the silver Peninsular medal and clasp; and received the thanks of Parliament in 1813 for distinguished service. He had crossed the tropics twelve times, the equinoctial line twice, had circumnavigated the globe, and had been in North and South America, Australia, the north of Europe, and the Mediterranean.

The best résumé that can be given of his character and pursuits

will be found in the following letter from our late President, Admiral W. H. Smyth :—

“ You wish to know my opinion as to the estimation in which I hold the merits of my admirable friend, General Sir Thomas M. Brisbane. My knowledge of the pursuits of this eminently distinguished officer is of many years' standing, and my personal acquaintance with him almost as long ; for, shortly after the peace of 1815, we met, British soldier and sailor—of all places in the world—in a French astronomical observatory ! And I can render testimony to the high regard paid by his late enemies to his scientific attainments.

“ From long intercourse I can have no hesitation in pronouncing that Sir Thomas was equally familiar with the theory and practice of astronomy ; and he not only worked himself, but was the cause of work in others. Nor should it be overlooked that intellectual zeal at that time was even more meritorious than of late, since it was necessarily exerted among the incessant and frequently distracting duties of actual warfare.

“ About the year 1820, when appointed to the high office of Governor of New South Wales, Sir Thomas resolved to improve our astronomical knowledge of the Southern Hemisphere. With this important object in view, previous to sailing for his destination, he made direct inquiries in various quarters as to how it could be executed to its fullest extent ; and I cannot but feel proud of having been consulted on that very interesting occasion.”

After detailing the establishment of the Paramatta Observatory, and its result—“ The Brisbane Catalogue of Southern Stars ”—the Admiral concludes :—

“ The well-known military career of Sir Thomas Brisbane is now matter of history ; but I may truly assert that there is not, either in the army or navy, an individual to whom ‘ *tam artibus quam armis* ’ can be more appropriately applied than to that excellent and honoured officer.”

Isambard Kingdom BRUNEL, Esq., one of the most eminent engineers of the day, was born at Portsmouth in 1806, while his father, the late Sir Mark I. Brunel, was engaged in erecting the Block-factory there. The principal works with which Mr. Brunel's name will in future ages be associated, are the Thames Tunnel, in conjunction with his father ; the *Great Western*, and the *Great Eastern Steam Ships*, both, at their respective periods, the largest vessels ever built ; docks at various seaports ; the *Great Western Railway*, with

its various branches and continuations; the Hungerford Suspension Bridge; the Tuscan portion of the Sardinian Railway; and the Hospitals on the Dardanelles, erected during the late war with Russia.

The President of the Institute of Civil Engineers in his address remarks: "In his professional career, it appears to me that full justice has not been done to the memory of Mr. Brunel. I allude more especially to his exertions in accelerating the progress of Oceanic Steam Navigation. The *Great Western* was a brilliant example of the correctness of his conceptions in this point. It must be conceded, that he was the first clearly and practically to conceive the advantages to be derived from augmenting the size of steamers, with a view to increased speed and to the extension of their voyages. Looking back, therefore, to the period of the construction of the *Great Western* steamer, she must be admitted to have been an absolutely successful experiment, mechanically and commercially; and the names of Brunel as the engineer, of Patterson as the shipwright, and of Maudslay and Field as the constructors of the engines, can never be omitted from the records of Oceanic Steam Navigation. The next step was the *Great Britain*; and so far as regards the construction of the hull, the efficiency of that vessel, even to the present day, bears ample testimony to the skill of the design; whilst her having endured a whole winter's buffeting of the waves in Dundrum Bay, testifies to the strength of her construction, and to the powers of resistance of which iron vessels are susceptible. It must not be forgotten, that it was to this vessel that the screw-propeller was first applied; and it should be stated, that by Mr. Brunel's exertions in experimenting upon the *Archimedes*, the introduction of that mode of propulsion was greatly accelerated." He was very early distinguished for his powers of mental calculation, and not less so for his rapidity and accuracy as a draughtsman. His power in this respect was not confined to professional or mechanical drawings only. He displayed an artist-like feeling for and love of art, which in later days never deserted him. He was elected a Fellow of this Society in 1852, and showed his interest in it by a frequent attendance at our evening meetings.

In the death of the Hon. Mountstuart ELPHINSTONE the Society has lost one of its earliest and most distinguished Fellows. He was born in 1779, and repaired at an early age to India, in the civil employment of the East India Company; and gradually

rose to all the principal offices of the diplomatic service at a time when our conquests were at their highest progress under the brilliant administration of the Marquess Wellesley. His friend and fellow labourer, Sir John Malcolm, said of him at the close of his public career, some thirty years subsequently, on the night of a great gathering at Bombay to bid Mr. Elphinstone "God speed" back to his native land, that from the day he, Sir John, met him a stripling on the beach to that hour (and the interval comprised years most eventful in the history of British India), Mr. Elphinstone had performed a distinguished part in every great political event that had occurred. In 1801 he was appointed an Attaché to the Residency at Poonah, and on General Wellesley's visiting that court he asked the Resident "to give him young Elphinstone." This was declined at the time, but in consequence of illness compelling Sir John Malcolm to resign the office of interpreter in 1803, Elphinstone joined the staff of the Duke of Wellington, and fought by his side in the most remarkable of those Indian battles that taught him how to conquer Spain. In 1806, the then Governor-General, the Earl of Minto, selected Mr. Elphinstone for the important and difficult mission to Cabul, a country at that time almost unknown to us; and of that mission he published, six years after, an able and instructive narrative.* The travels of our medallist Sir Alexander Burnes, and our national disasters in that country, having afterwards drawn the attention of the British public to those regions, a third edition of the work was called for thirty years after it was first published, acquiring for its author considerable literary reputation.

In 1810 Mr. Elphinstone returned to Poonah as Political Resident, and "there," says a recent writer, "for eight years he conducted the British relations with the faithless, subtle, intriguing ruler of the Mahrattas in a manner which, for able statesmanship, has never been surpassed." The principal part of the Peishwah's dominions having been annexed in 1819, he was eventually raised to the government of Bombay, where for seven years he discharged its duties with the utmost talent and skill. In this position the liberal and enlightened Bishop Heber saw him, and described him as "in every respect an extraordinary man, possessing great activity of body and mind, remarkable talent for and application to public business, a love of literature, and a degree of almost

* Account of the Kingdom of Cabul.

universal information, such as I have met with in no other man similarly situated; and manners and conversation of the most amiable and interesting character."

A statue by Chantrey, a portrait by Lawrence, a service of plate, and, above all, the establishment of an "Elphinstone College" and two "Elphinstone Professorships," are the enduring monuments of Mr. Elphinstone's government of Western India. On his return home, shattered in health and exhausted by official labours, he betook himself with ardour to the study of the classics of ancient and modern Europe, to be added to the store of his already ripe Oriental knowledge. In these studies, and in the preparation of his 'History of India,' he passed the first fourteen years of his home residence. The research necessary for the History of the Mogul rule in Hindustan was enormous; and the style in which that elaborate work is written marks the accomplished scholar.

The last eighteen years of Mr. Elphinstone's life were spent in literary retirement. On the 20th of November, and in the 81st year of his age, the useful, blameless, and happy life of this eminent man was brought to a close by a stroke of apoplexy.

By the decease of William Richard HAMILTON, England has lost one of her best public servants, and a steadfast promoter of letters, art, and science; while this Society recognises in him one of its earliest adherents, long one of the Council, and who, after filling the offices of President and Vice-President, only retired from our Trusteeship a year before his death.

Born in 1777, Mr. Hamilton was educated at Harrow School and at the University of Cambridge, where he acquired that thorough classical knowledge which enabled him soon afterwards to prove of signal service to his country.

He began life in the diplomatic service as the attaché and private secretary of the late Lord Elgin, with whom he proceeded on an embassy to Constantinople in the year 1799. In 1801, being sent to Egypt (then rescued from French occupation by the British arms), Mr. Hamilton, in company with Colonel Hilgrove Turner, so ably negotiated the terms of peace as to procure the cession of many of those noble works of Egyptian art which now adorn the British Museum. Among these was the famous Trilingual Stone of Rosetta, which, from its comparatively small size, had been hid away in a French transport, from which Mr. Hamilton rescued it at the risk of his life, as the vessel was infected with the plague. In the subsequent year Lord

Elgin having obtained from the Porte the gift of the famous marbles of the Parthenon, Mr. Hamilton was conveying them to England when the ship was wrecked at Cerigo, and those treasures were submerged. But, thanks to the perseverance and zeal of our deceased Associate, these productions of the very finest period of Greek Art were extricated from the deep, and have long constituted the chief ornaments of our great National Museum.

Following up his leading bent, Mr. Hamilton became a Fellow of the Society of Antiquaries in 1804, and distinguished himself by various publications in the Transactions of that body, among which his memoir 'Remarks on the Ancient Fortresses of Greece' was the precursor of that valuable and more extensive publication which he issued in 1810, under the title of 'Ægyptiaca.'

His public career was in the mean time essentially bound up with the business of the Foreign Office. Acting as secretary of Lord Harrowby and précis writer to Lord Mulgrave, he became Under-Secretary of Foreign Affairs in 1809. In the stormy and eventful period of the next six years, including the Peninsular War, and the battle of Waterloo, Mr. Hamilton held the same important office, which he occupied even to the year 1822, when he was appointed Minister at Naples. At the peace of Paris, in 1815, when he accompanied Lord Castlereagh to the Continent, we find Mr. Hamilton again standing forward in his love of the Fine Arts, and serving as an agent of the British Government in procuring the restitution to Italy of those famous paintings and sculptures of which she had been deprived by the French conquests.

In the fine arts then, as in antiquarian research, Italy as well as our own country has been deeply indebted to two William Hamiltons—the one the celebrated contemporary of Nelson, the other our deceased Member, and both of them British Ministers at Naples. The last official appointment indeed held by Mr. Hamilton was that of Minister Plenipotentiary and Envoy Extraordinary to the King of Naples, in which position he truly enjoyed life, by studying the relics of classical art, and in cultivating the acquaintance of all the eminent Italians, including Canova.

Returning to England in 1825, and retiring from public life on his well-earned pension, Mr. Hamilton then gave himself up to the pursuits of literature and science, in promoting which he proved so eminently useful. As early indeed as 1813 he had become a Fellow of the Royal Society; and in 1830, when this Society was founded, he took an active part in its formation, and also acted

for many years as the Treasurer of the Royal Institution of Great Britain.

Those only who were intimately acquainted with Mr. Hamilton could form an adequate idea of his valuable intrinsic qualities. Void of all display, his knowledge on a vast variety of subjects was profound and accurate; and while he could control and manage details of every-day business, he found time for much literary, antiquarian, and geographical research. He was also during twenty years one of the most efficient and useful trustees of the British Museum, as all his associates have testified. In that great National Repository of art and natural science, he who had brought to it so many of the finest works of Egyptian and Greek sculpture might well look around him with a proud and pleasing retrospect. But although he had deservedly acquired the name of Grecian Hamilton, his preference for the finest productions of art never led him to form a too exclusive estimate of the value of his favourite researches. Though not a naturalist, he had the highest respect for those who cultivated natural history; and so equitable and fair was he in his judgments, that those trustees who represented that portion of the British Museum have uniformly rejoiced that Mr. Hamilton was associated with them; for in him they felt secure that they could depend upon a man whose votes were always regulated by the desire to promote not one only, but all the departments of our great National Repository.

Having adverted to the career of Mr. Hamilton as a public servant, and as a cultivator of letters and the fine arts, let us here specially record our thanks to him for his well-performed duties as a geographer. At the head of those duties we are bound gratefully to remember that in 1838, the first year of his Presidency, he set the example of reading from the chair an Anniversary Address, which practice, followed up by him in the succeeding year, and never since departed from, has been one of the efficient means of raising our Society to its present enviable position. We may well therefore revert to that which may be called our inaugural discourse; for although we had then been a Society for seven years, and had enjoyed the advantage of receiving Annual Reports from our able Secretaries, we still lacked that enlarged view of our general objects which was first eloquently put before us by Mr. Hamilton. After developing all the links which bind Geography to History and Statistics, as well as to the sciences of Astronomy, Geometry, Natural History, and Geology, and showing that such researches

are comparatively easy in civilized countries, Mr. Hamilton thus proceeds: "But the real geographer becomes at once an ardent traveller, indifferent whether he plunges into the burning heats of tropical deserts, plains, or swamps, launches his boat on the unknown stream, or endures the hardship of an Arctic climate, amidst perpetual snows or ice, or scales the almost inaccessible heights of the Chimborazo or the Himálaya. Buoyed up in his greatest difficulties by the consciousness that he is labouring for the good of his fellow-creatures, he feels delight in the reflection that he is upon ground untrodden by man, that every step he makes will serve to enlarge the sphere of human knowledge, and that he is laying up for himself a store of gratitude and fame." *

These stirring words were followed up by such clear and precise analyses of all the prominent geographical researches of the year as to fix a high standard for the discourses of all future Presidents. When indeed those researches had reference to Archæology and Numismatics, or to any point of ancient history, then it was above all that Mr. Hamilton shone out as the most powerful comparative geographer, and then it was that we felt the true value of the application of his learning.

Let it also be said that our deceased member was equally fervid in his appreciation of geography in its newest phases. Whilst the "world known to Homer" and the ancients had charms for him which he thoroughly enjoyed, his capacious mind revelled in that spirit of modern discovery which he characterised as "the happy spell which changed the destiny of nations, and without which we should long have remained immersed in the darkness in which our ancestors groped their way in the pursuit of knowledge, and should have lived on upon the ill-digested remnants which the ancients had left us."

Although he preserved a clear and unruffled mind to the last, Mr. Hamilton retired a year before his decease (then in his eighty-second year) from the active duties of life, resigning in succession his offices as trustee of the British Museum and of our Body; it having been a dominant feature in his character never to take part in any occupation to which he could not thoroughly devote all his powers. One body only,—that club of lovers of the fine arts called the "Dilettanti,"—he continued to manage with efficiency to within a week of his decease.

* Journal of the Geographical Society, Vol. VIII. President's Address, p. xxxix.

If the varied merits of our former President have thus been glanced at, as they were exhibited in public through a long, active, and well-spent life, those who were admitted to his personal friendship learnt to admire in Mr. Hamilton many sterling social qualities, for no one of which was he more remarkable than in the admirable instruction which he gave to his children, who, including one of our Presidents, and other sons distinguished in the civil, military, and naval service of their country, together with an only accomplished daughter, are left to mourn his loss.

The late Lieutenant-Colonel William Martin LEAKE was born in London on the 14th January, 1777. He was the son of John Martin Leake, a commissioner for auditing the public accounts, and grandson of Stephen Martin Leake, Garter Principal King-at-Arms; the family name of Leake having been derived from Sir John Leake, the famous Admiral of Queen Anne's reign.

After preliminary instruction at the Royal Academy of Woolwich he obtained his commission in the Artillery in the year 1794, and commenced his professional career in the West Indies. In 1799 he entered the field of his subsequent labours on being appointed to a mission for the instruction of the Turks in the use and practice of artillery, and repaired to Constantinople for that purpose. Early in 1800 he quitted that capital for more active service, and it having been deemed advisable by the English Ambassador that the Grand Vizier, then engaged in the defence of the southern provinces of the Turkish empire against the French, should have the assistance and advice of competent English officers, General Koehler, Captain Leake, and others, were despatched to Jaffa. They traversed Asia Minor, and visited the island of Cyprus; but meeting there Sir Sidney Smith, who had just signed a treaty for the evacuation of Egypt by the French, their attendance on the Vizier was no longer considered essential, and they returned to Constantinople. That treaty not having been confirmed, Captain Leake again proceeded on his way, and ultimately joined the army of the Grand Vizier in Syria, where, in the winter of the same year, he took advantage of his position to visit the greater part of ancient Palestine and Judæa.

In 1801 he crossed the Desert, and entered Egypt with the Turkish army; and Alexandria having been surrendered, and the French withdrawn, he received the directions of Lord Hutchinson to accompany the late Mr. William Richard Hamilton (then private secretary to Lord Elgin) into Upper Egypt, for the purpose of

making a general survey of that country, as well in regard to its military and geographical, as to its political and commercial state. The results of these labours were a map of the course of the Nile, from the Cataracts to the sea, a determination of most of the ancient sites, a description of all the monuments of antiquity contained in that space, together with a large collection of observations on the agricultural and commercial state of the country: an account of this journey was published by Mr. Hamilton in 1809.

In 1802 Captain Leake revisited Syria, and continued there the researches on which he had been employed in Egypt; and on his return home, having embarked on board the vessel in which Mr. Hamilton was conveying the Elgin Marbles to England, he was wrecked off the Island of Cerigo, and narrowly escaped with his life.

The acquaintance with Oriental politics and habits, which he had acquired during this service, was doubtless the cause of his subsequent selection for an important mission to the European provinces of Turkey. He received orders from His Majesty's Government to undertake a survey of the coasts and interior of that country, to examine its fortresses and means of defence, to point out their deficiencies to the native Governors and Chiefs, and advise for their improvement; and on that service he repaired in the year 1804.

From 1804 to the winter of 1806 he travelled considerably, in pursuance of his instructions, in Northern Greece and the Morea, and while he performed the important duties of his mission in a manner that gave entire satisfaction to the Home authorities, his peculiar tastes and talents for research received full development in a country where every day's journey produced an historical or topographical problem, which it taxed his erudition and critical acumen to solve; and where his thorough knowledge of ancient Greek enabled him to decipher obscure inscriptions, which led to the identification of many a ruined site.

The occurrence of hostilities, at the end of 1806, between England and the Porte prevented him from prosecuting his travels. He was detained as a prisoner at Salonica, whence, however, he escaped; and finding his way to Malta, he proceeded to England for the restoration of his health. Subsequently, he was again employed by His Majesty's Government in Greece till 1809; and it was on the observations made with so much keenness and perseverance during these years, from 1804 to 1809, extended by

subsequent reflection and study, that were formed those valuable and standard topographical works that appeared so many years later, which, by their well-weighed arguments and accurate observations, have justly caused their author to be termed a "*model geographer*," and from this period also may be dated that partiality for the modern Greek people, that indulgence for their weakness, and that hope for their future, which afterwards inspired many of his lesser writings, and coloured his conversation.

In 1814 Lieutenant-Colonel Leake was, as an English officer, appointed to attend upon the army of the Swiss Confederation, under the command of the Archduke John, and was for months at Berne, in that capacity, at the conclusion of the great European war.

On his return to England his literary labours commenced, and were continued with little intermission, and but little farther interruption from his more purely professional duties (for he retired from the army in the year 1823), until the day of his death.

In the year 1814 were published his '*Researches in Greece*,' in 1821 his first edition of the '*Topography of Athens*,' and in 1822 his edition of '*Burckhardt's Travels in Nubia, Syria, and Arabia*.' In 1824 he narrated the observations he made in Asia Minor 24 years previously. In 1826 issued the '*Historical Outline of the Greek Revolution*,' and in 1829 the '*Demi of Attica*.' In 1830 he published one of his greatest and most learned works, accompanied by a valuable map, his '*Travels in the Morea*,' which, in 1835, were succeeded by his '*Travels in Northern Greece*,' a work of equal research and more extensive proportions, with an accurate map on a considerable scale also; and, in 1841, appeared the 2nd edition of the '*Topography of Athens*.'

The latter years of his life were occupied in the production of the '*Numismata Hellenica*,' a most considerable and important work, containing an exact and faithful description of every coin in his extensive collection, enriched by critical and historical notes. This was published in 1854; and in 1859, but a few weeks before his death, a supplement on the same plan as the original work issued from the press, forming with that a mine of information for the collector, the antiquary, and the historical student, who in turn might find, as Colonel Leake himself had found, that the design on a coin could throw strong light upon many a question of ancient history or topography otherwise obscure or disputed.

Colonel Leake was a fellow of several learned Societies, both

English and foreign. He was admitted a member of the Society of Dilettanti in 1814; and on the death of Lord Northwick and Mr. Hamilton, in 1859, became second on the list, Lord Aberdeen only being above him. In 1828 he was elected a member of *the Club*, and at the time of his death was senior member of the Royal Society Club, except one. He was a fellow of the Royal and the Royal Geographical Societies, and an honorary member of the Asiatic, a vice-president of the Royal Society of Literature, an honorary member of the Royal Academy of Sciences at Berlin, and a correspondent of the Royal Institute of France.

In 1838 Colonel Leake married Elizabeth Wray, eldest daughter of the late Sir Charles Wilkins, and widow of William Marsden, both of whose names are honourably known to the Oriental literary world.

On the 6th January, 1860, Colonel Leake passed from us after a short and sudden illness; his intellect never weakened, his energies scarcely relaxed, notwithstanding the weight of 83 years. A very striking feature of his character was his modest and retiring nature; endearing him to all who knew him intimately, but disguising from others, less familiar with him, many of those eminent qualities of intellect and high scholarship which he possessed.

Colonel Leake was buried at the Kensal Green Cemetery. The Greek minister, at his own desire, followed him to the grave, expressing thereby the gratitude of his country to one who had spared no effort on behalf of the Greek nationality, and had done so much by his works towards elucidating the remarkable features of the land of Greece and the scenes of her glorious history. In him we have lost not only a scholar and an antiquary, but one other link (when so few survived) that connected us to the politics, the literature, and the society of the foregone generation.

LORD LONDESBOROUGH, the second surviving son of Henry, first Marquis Conyngham, by his marriage with Elizabeth, daughter of Mr. Joseph Denison, was born on the 21st of October, 1805. He was twice married: first, July 6, 1833, to the Honourable Henrietta Maria Forester, fourth daughter of the late Lord Forester, who died in April, 1841; and secondly, in 1847, to Miss Bridgeman, eldest daughter of Captain the Honourable Charles Orlando Bridgeman, which lady survives her husband. His Lordship leaves issue by both marriages. As Lord Albert Conyngham he served for a short period in the Royal Horse Guards, but then adopted the

diplomatic service. In May, 1824, he was appointed attaché to the British Legation at Berlin, and in the following year removed to Vienna, where he remained until February, 1828, when he was made Secretary of Legation at Florence. In July, 1829, he proceeded to Berlin in the same capacity, and continued in that employment till June, 1831. He sat in the House of Commons for some years previous to his elevation to the House of Lords, having represented Canterbury from 1835 to 1841; and again from March, 1847, to the early part of 1850, when he was raised to the peerage by the title of Baron Londesborough. In 1849 he assumed the name of "Denison," in lieu of that of Conyngham, in accordance with the will of his maternal uncle, Mr. William Joseph Denison, who bequeathed to him the bulk of his immense wealth. In politics Lord Londesborough was usually a supporter of Whig principles. He was created by George IV., in 1829, a Knight Commander of the Hanoverian Order, and was a Deputy-Lieutenant of the West Riding of York.

Lord Londesborough's taste for literature, science, and the fine arts, brought him into connexion with this and most of the learned Societies, and with their leading men. He availed himself of every opportunity to co-operate with and to give them encouragement and substantial support. No one was perhaps more identified with the progress of the study of our national antiquities. During his residence at Bourne Park, near Canterbury, he was enabled to make many successful researches in a branch of archæology heretofore but imperfectly understood, and his and Mr. Akerman's communications to the 'Archæologia,' on the contents of the Saxon tumuli upon Breach Downs and in the neighbourhood, recorded a series of facts which have been often referred to, and which were rapidly augmented by fresh discoveries, made either at his Lordship's instigation, or in consequence of his example. In later times his Lordship instituted similar researches in Yorkshire with equal success.

When the British Archæological Association was formed, he (then Lord Albert Conyngham) accepted the office of President; and by his personal exertions and influence mainly contributed to the triumph of the new institution at its first congress at Canterbury.

The general collection of works of early and mediæval art at Grimston may be estimated by his 'Miscellanea Graphica,' a

splendid work in folio, edited by Mr. Thomas Wright, and illustrated by Mr. Fairholt.

Towards the close of 1848 his Lordship visited Greece and Italy, and in the following year printed his tour, under the title of 'Wanderings in Search of Health:' a volume containing much information and well-told personal adventures.

Baron Peter MELVILL VAN CARNBEE was born 20th May, 1816. He received his naval education at the late Royal Naval Institution at Medemblik. In 1835, when a midshipman, he made a voyage to the East Indies, and having returned to the Netherlands in 1838, was promoted to Second Lieutenant, and proceeded once more to the East Indies, where he remained until 1845, being engaged in the Surveying Office of East Indian Hydrography. He then came back from the East Indies to Holland in charge of the Overland Mail. In the year 1850 he sailed again for the East Indies, and was promoted to First Lieutenant, and elected Secretary of the East Indian Hydrographical Office. In October, 1856, he was promoted to Captain-Lieutenant, and died at Batavia in the fortieth year of his age.

Baron Melvill took little active part in surveying, but devoted himself to the study and compilation of the surveys of former and recent naval officers, and constructed from them charts and sailing directions. In this work his industry and intelligence were soon manifested, and the following are some of the more important works published by him:—

'Seaman's Guide Round Java,' which has been translated into the English language, and 'Le Moniteur des Indes,' by Melvill and Siebold, in 4 vols. The charts compiled by him are—'Passages between Sumatra and Borneo, with Riour, Singapore, &c.,' 'The North Part of the said Chart with Anambas and Natuna Islands,' 'Chart of the Island of Java, and Passages Round Java,' in 5 sheets, 'Charts of the Strait of Macassar and of the Islands east of Java,' by Melvill and Smit. In addition to these he has constructed and published many small maps, the principal of which are, 'Carte Générale des Possessions Néerlandaises aux Indes Orientales, 1846,' 'Carte de l'Île de Celebes, 1848,' 'Carte de l'Île de Java, 1847,' 'Carte de l'Île de Sumatra, 1848.' The latest work on which he was engaged, was the 'Algemeene Atlas van Neerland's Oost Indie.' His life was not spared to allow of his publishing more than 12 sheets, and the completion of this atlas will have to be effected by others.

He was a member of many Societies, and regret for the loss of this distinguished and amiable man is not confined to his personal friends, but is shared by naval men and Geographers, who must feel greatly indebted to him for the light he has thrown on the Hydrography of the East Indian Archipelago.

Captain William Moorsom, R.N., C.B., entered the Royal Navy in 1830, passed his examination in 1835, and at the period of his promotion to the rank of Lieutenant in 1842, had been serving for some time in the East Indies as mate on board the *Endymion*. From that period up to his death he served with distinction in different stations, received post rank in 1851, and afterwards the Companionship of the Bath, as well as several foreign distinctions. He became a Fellow of this Society in 1853, and died in the early part of the present year.

The Venerable William Forbes RAYMOND, Archdeacon of Durham. —At Lincoln's Inn Mr. Raymond was appointed Warburtonian Lecturer, and also filled the post of Assistant-Proacher to Bishop Heber and to Bishop Maltby. He availed himself of this opportunity of applying, with great success, his learning and his skill in the Oriental languages to the illustration of Scripture. When Bishop Maltby resigned the position in 1835, he expressed his deep sense of the faithfulness and ability shown by Mr. Raymond in the office of his assistant.

The friendship and assistance of Mr. Raymond were of the greatest value and comfort to Bishop Maltby during the remainder of his Lordship's life, especially during his episcopal career in the dioceses of Chichester and Durham. As Examining Chaplain he gained the affection of the candidates for holy orders by his urbanity, and his kind and judicious advice. Whenever he found any who were anxious to pursue their theological studies in the midst of their parochial ministrations, he not only gave them the most friendly encouragement, but furnished them with such directions as might enable them to employ learning to real practical purposes. Sacred geography was one of his favourite subjects, and he pointed out to the young clergyman how deeply interesting such a subject might be rendered for expositions in the church, as well as for study in private.

After repeatedly refusing valuable preferment which Bishop Maltby offered him, he at last, in 1846, accepted the Archdeaconry of Northumberland, endowed with one of the reduced canonries in Durham Cathedral. To the great regret of the clergy he resigned the Archdeaconry in 1853. Indeed they were justly grieved at being deprived of the services of one who had gained their confidence and esteem by his sound judgment and ready attention in his official intercourse with them, as well as by his

gentleness of manner, and sympathy with them in their ministerial trials.

Archdeacon Raymond became a Fellow of this Society in 1852, and was a frequent attendant at our evening meetings.

Professor Karl RITTER was born at Quedlinburg in 1779, and at the age of five years was received gratuitously into Salzmann's educational establishment at Schnepfenthal, where he remained eleven years; whence he was removed to the University of Halle, and, remaining there for two years, then went to Frankfort. Here he met with men eminent in science, among whom were Humboldt, Buch, and Sömmering the physician. Ritter's first literary essays were published in the 'Kinderfreund,' from 1803 to 1806. In the latter year he published six maps of Europe, and in 1811 a 'Geography of Europe,' in 2 volumes.

In 1814 Ritter proceeded to the University of Göttingen, where he prepared the plan for his great work on Comparative Geography, a work which will long remain a record of the perseverance of the author. The first volume of this work was brought out in 1817, and the second volume, concluding Asia, in 1820. The year previously Ritter had been appointed Professor of History at the Frankfort Gymnasium, but soon after proceeded to Berlin, where he was made Professor of Geography at the Military Academy and the University. At first his lectures were sparingly attended. The Professor's fame, however, soon spread, and the largest lecture-hall could barely accommodate the numbers desirous of hearing them. The lectures most crowded were those on General Geography, on Palestine, on Greece, and on Italy. His professional duties left Ritter but little leisure to bestow upon the second edition of his 'Geography;' nevertheless, from 1822, the date of the appearance of the first volume, to within a short time of his death, he carried the work to the 19th volume of Asia. I perfectly agree with the learned Mr. Norris, that "the labours of Karl Ritter are characterized by great industry, and an anxious desire to gather up, and systematically to arrange, every fact relating to the regions treated of in his work, and to leave no source unexplored from which any information was to be derived. His great work comprises not only the geography of each country strictly considered, but also the history, antiquities, politics, ethnology, natural history, and an account of any travels through them which may tend to throw light upon their condition." During his

last visit to England, he was a frequent attendant at the rooms of this Society. Ritter was one of the founders of the Geographical Society of Berlin, and an Honorary Member and Medallist of this Society, to which he also contributed his works. Dr. Kiepert has been elected to the Professorship vacant by the death of the lamented Karl Ritter.

Dr. John SIMPSON, M.D., R.N. — Dr. Simpson accompanied Captain Moore in the *Plover* to Behring Strait in search of Sir John Franklin and his companions in 1848, and after passing three winters in that locality, returned with Captain Moore and the other officers, via San Francisco, to England. He immediately volunteered to go back, by the same route, with Captain Maguire, who was appointed to succeed to the command of the *Plover*. He again passed three winters in the ice, two of which were at Point Barrow. He was greatly beloved by every one on board, and was so successful in his treatment of the crew that not a single life was lost. He made himself acquainted with the Esquimaux language, and wrote the best—indeed it may be said the only—account of the Western Esquimaux, and which will be found at page 917 in the Arctic Blue Books for 1855, and in the pages of the 'Nautical Magazine,' and will ever be considered a most valuable acquisition to our ethnographical knowledge of that part of the globe. On his arrival in England he was ordered to Malta Hospital, and rendered good service there during the Crimean war. He was afterwards promoted to Haslar Hospital, where his brief, but most useful and honourable career in the service terminated. Dr. Simpson was elected a Fellow in 1855, and took a warm interest in the Society. He was a highly talented man, well versed in his profession, utterly regardless of self, and devoted the best energies of his mind in advancing the happiness of others; in a word, he was a true Christian, well deserving of imitation in his singleness of purpose.

Robert STEPHENSON, one of our most eminent engineers, and M.P. for Whitby, was born at Willington in 1803, under very humble circumstances. On leaving school, at the age of fifteen, Robert Stephenson was apprenticed to Mr. Nicholas Wood at Killingworth, to learn the business of the colliery, where he served for three years, and became familiar with all the departments of underground-work. He was afterwards sent, in the year 1820, to the Edinburgh University, where Hope was lecturing on Chemistry, Sir John Leslie on Natural Philosophy, and Jameson on Natural

History. Stephenson remained in the University six months only, but is said to have acquired in that brief period as much knowledge as is usually done in a three years' course. It cost his father 80*l.*, but the money was not grudged when the son returned, bringing with him the prize for mathematics, gained at the University.

In 1822 Robert Stephenson was apprenticed to his father; but his health giving way after a couple of years' exertion he accepted a commission to examine the gold and silver mines of South America. The change of air and scene contributed to the restoration of his health; and after having founded the Silver Mining Company of Columbia he returned to England to assist his father in the arrangements of the Liverpool and Manchester Railway, by placing himself at the head of the factory at Newcastle. He obtained the prize of 500*l.* offered by the directors of that company for the best locomotive engine; and, about the same period, designed for the United States an engine specially adapted to the curves of American railways; and to him we are indebted for the type of the locomotives used in both hemispheres. The next great work upon which Stephenson was engaged was the survey and construction of the London and Birmingham Railway, which he undertook in 1833. He had already been employed in the execution of a branch from the Liverpool and Manchester Railway, and in the construction of the Leicester and Swannington line, so that he brought to his new undertaking considerable experience. His evidence before Parliamentary committees was grasped at, and it may be said that, in conjunction with his father, he has directed the execution of more than a third of the lines in the country. They were both consulted as to the Belgian system of railways, and obtained the Cross of the Legion of Honour in 1844. For similar services performed in Norway, which he visited in 1846, Robert Stephenson received the Grand Cross of St. Olaf. So also he assisted either in actually making or in laying out the systems of lines in Switzerland, in Germany, in Denmark, in Tuscany, in Canada, in Egypt, and in India. As the champion of locomotive in opposition to stationary engines, he resisted to the uttermost the atmospheric railway system, which had at one time considerable repute. The bridges he erected include that at Newcastle, constructed of wood and iron; the Victoria Bridge at Berwick, built of stone and brick; the bridge in wrought and cast iron across the Nile; the Conway and the Britannia Bridges over the Menai

Straits; and the Victoria Bridge over the St. Lawrence. Speaking of Stephenson in his address to the Institute of Civil Engineers the President remarks: "One of the distinguishing characteristics of his professional career was, that however bold he was in the conception of an idea, as for instance the Britannia Tubular Bridge, yet no one with whom I ever came in contact, watched with more anxiety the completion of these enterprises than did Mr. Stephenson. His mind was ever occupied in anticipating how, and in what shape, failures might arise. Another distinguishing feature in our late friend's career was his treatment of all those who were associated with him in his undertakings; his habit, with those who enjoyed his confidence, was to leave with them the utmost amount of responsibility which he could possibly lay upon them, and never to interfere, except in cases of emergency, or where his moral influence was required to prevent undue interference from superior authorities. The consequence has been, that over the whole face of the globe there are men of his school who have risen to competency and to eminence, and who live to extol and respect the memory of their revered chief."

He took great interest in all scientific investigations, particularly in the pursuits of this Society, being himself a great traveller and a valued Member of the Council at the period of his death. As a specimen of his liberality in the cause of science, it may be mentioned that he placed his yacht, the *Titania*, at the disposal of Professor Piazzzi Smyth (the son of our former excellent President, Admiral W. H. Smyth), who was sent out with very limited means to Teneriffe, to make sundry scientific observations, and thus materially assisted the researches of that gentleman. In the same spirit he came forward in 1855, and paid off a debt amounting to 3,100*l.*, which the Newcastle Literary and Philosophical Society had incurred, his motive being, to use his own phrase, gratitude for the benefits which he himself had received from it in early life, and a hope that other young men might find it equally useful.

At the Leeds Meeting of the British Association of Science, he proposed a yacht trip to Iceland, to be accompanied by Dr. Shaw and others; but his health had been delicate for about two years, and he complained of failing strength just before his last journey to Norway. If his loss be severely felt in his profession, it is still more poignantly so in his large circle of friends and acquaintances. His benevolence was unbounded. His own pupils are

said to have regarded him with a sort of worship, and the number of men belonging to the Stephenson school who have taken high rank in their peculiar walk shows how successful he was in his system of training, and how strong was the force of his example. The feelings of his friends and associates were not less warm. . . He has passed away, if not very full of years, yet very full of honours.

Sir George Thomas STAUNTON, Bart., D.C.L., was the only child of the late Sir George Leonard Staunton, who is well known to the public as having accompanied Lord Macartney as Secretary of the first embassy to China, in the year 1792, and as the author of the account of the Embassy which was published afterwards. He is not less well known to those who are acquainted with the history of British India as having, when Lord Macartney was Governor of Madras, concluded the peace with Tippoo Sultan in the year 1782.

Sir George was born in May 1781, and died, after a succession of paralytic seizures, in the summer of the last year. He succeeded his father in the baronetcy in the year 1801. After his father's death he was the last male representative of a very ancient English family, the branch of it from which he was descended having been established as landed proprietors in the county of Galway since the middle of the 17th century.

In the year 1792 he accompanied his father to China, under the nominal designation of page to the Ambassador. For some time before the embassy embarked, and during the voyage to China, he had the opportunity of studying the Chinese language under two native Chinese missionaries from the Propaganda College at Naples; and he soon made such proficiency in acquiring a knowledge of it, as to be able to speak it with tolerable fluency, and to copy papers written in the Chinese character. In this manner he became a very useful appendage to the embassy. When the embassy was presented at the Chinese Court, the Emperor inquired for the little boy who could speak Chinese, conversed with him for some time, and good-naturedly presented him with an embroidered yellow silk purse for holding areka-nuts from his own girdle.

On leaving China, Sir George L. Staunton engaged a Chinese servant to accompany him to England, in order that his son, by constantly communicating with him in Chinese, might keep up and extend his knowledge of the language.

In the year 1799, having received the appointment of Writer in the factory of the East India Company at Canton, young Staunton

proceeded a second time to China. He remained at Canton, with some occasional visits to Europe, until the year 1817, having for some time before his final return to England filled the office of chief of the factory. His residence in China afforded him the opportunity of still farther advancing himself in a knowledge of the Chinese language by means of native teachers. He was the first member of the factory that had ever studied the language of the country in which their duties required them to reside; and thus he became very useful by superseding the necessity of employing native interpreters, in whom (principally from the fear which they had of the local authorities) much confidence could not be placed. While residing in China he made several translations from the Chinese, the principal one of these, and that a work of great importance, being the 'Ta Tsing-leu-lee,' or Chinese penal code. This last was published in the year 1810. Other translations of much interest, though of inferior importance to this, have been published since.

In the year 1816 a second embassy was sent to China, the late Lord Amherst, Sir Henry Ellis, and Sir George Staunton being appointed joint Commissioners of Embassy. An account of the proceedings of this embassy has been published by Sir Henry Ellis. Sir George Staunton, however, printed his private journal, and distributed copies of it among his friends.

After his return to England, Sir George Staunton purchased a house and landed property in Hampshire, where he afterwards resided during a part of every year. For some time he had the honour of representing South Hants in Parliament. He afterwards represented Portsmouth, and continued to do so until he resigned the charge a few years before he died.

After being finally re-established in England, he occupied himself but little with any of the pursuits of his early life; though it may be that his knowledge of botany had partly led him to the laying out of an extensive garden, with numerous hothouses and conservatories full of the rarest trees and plants.

Although his life was prolonged until he had entered on his 79th year, he was always of a delicate frame, and not capable of great physical exertion. Others observed in him a peculiar shyness and awkwardness of manner, of which his education affords an adequate explanation. But with this he on various occasions displayed great moral courage and determination. Many instances of this might be quoted, but one will be sufficient. On the occasion of the last embassy the Chinese Court refused to receive it unless the

ambassadors performed the ceremony of the *ku-tu* before the Emperor. Lord Amherst and Sir H. Ellis wished that they should do so, but Sir George was so satisfied that it would be regarded by the Chinese as an act of humiliation, and something like the homage paid to a feudal lord, that he positively refused his consent. The Chinese were aware of this, and threatened to dismiss the rest of the embassy, but to detain him as a prisoner. But he declared that this made no alteration in his view of the subject; that being convinced that he was right, he was quite ready to take his chance of whatever might befall him rather than swerve from what he regarded as the strict line of his duty.

Sir George was elected a Fellow of this Society in 1830, and remained one of its Trustees until his death.

Commander Charles TINDAL, R.N., entered the Royal Navy in 1800, and was employed for two years in the Mediterranean and Channel, and during the four following years served on the home station. He received his promotion as lieutenant in 1806, and was subsequently appointed to several ships; and in 1809, in the *Narcissus*, assisted at the reduction of the various islands in the West Indies; and contributed during a cruise in the Channel, in 1810, to the capture of the privateers *Duguay Trouin* and *Aimable Joséphine*, carrying between them 28 guns and 180 men. During the ensuing summer he was employed in active co-operation with the patriots on the north coast of Spain. He also made a voyage to Newfoundland, and in 1814, being then on the coast of North America, in the *Niemen*, took command of the boats of that ship, and in a very gallant manner cut out from Little Egg Harbour the letter-of-marque schooners *Quiz*, pierced for 14 guns; *Clara* and *Model*, each pierced for 12 guns. He retired with the rank of Commander, subsequently took the management of the Branch Bank of England at Birmingham, and afterwards that in Burlington Gardens. He became a Fellow of this Society in 1834.

Rear-Admiral Henry Dundas TROTTER entered the Royal Navy in 1815, sailed in 1818 in the *Eden* for the East Indies, and in 1819 accompanied the expedition under Sir Francis Collier against Ras-al-Khyma, the head-quarters and principal resort of the pirates of the Persian Gulf. Continuing on that station until 1823, and serving in several ships, he returned in the early part of that year to England, and was promoted to the rank of lieutenant. He next served for some years in the West Indies, and was made commander in 1826. He was afterwards employed on the West Coast of Africa,

and in 1841 took the command of the disastrous Niger Expedition. Having remained on half-pay for some years, he was appointed to the command of the Cape of Good Hope squadron, obtained his flag rank in 1857, and died suddenly last year.

Admiral Trotter joined this Society in 1839, and took the greatest interest in its proceedings; he was likewise a warm advocate for the suppression of the slave-trade.

The Rev. David WILLIAMS, D.C.L., Warden of New College, Oxford, died on the 22nd of March, at Oxford, in the 74th year of his age. Dr. Williams took his degree of B.C.L. in 1809, D.C.L. in 1824; was ordained deacon in 1809, and priest in 1810; was appointed second master of Winchester School in 1810, and held it up to 1823; in 1824 was appointed head-master, and held it up to 1835. He was appointed Canon of Winchester Cathedral in 1833, elected Warden of New College in 1840, appointed Select Preacher to the University in 1841, and Vice-Chancellor in 1856 to 1858, when he resigned the office in consequence of his declining health. The Rev. Dr. Williams joined this Society at its commencement, in 1830; and at the time of his decease he was Pro-Vice-Chancellor, a member of the Hebdomadal Council, and a Delegate of Estates.

Commander James WOOD, R.N., has been a useful contributor to our hydrographical knowledge of the globe. He began his career as a maritime surveyor at Fernando Po, under the late Admiral Fitzwilliam Owen, in the year 1827. He afterwards served in the *Hecla* in the Bight of Benin, and then went to the coast of California. He next joined the *Etna*, Captain Sir Edward Belcher, and assisted in his surveys on the African coast, on the Bar of Oporto, and on Skerki Bank off Tunis. He again returned to the coast of Africa in 1834 with Commander Skyring, and, after the death of that officer, he joined the *Raven*, and was employed in the survey of the west coast of Morocco and the Canary Isles. In 1836 Lieut. Wood served with Capt. Hewitt in the North Sea Survey, and in 1837 joined the survey of the coast of Wales and the south coast of England. From this station he was appointed to command the *Pandora*, accompanied Capt. Kellett in the *Herald* to continue the survey of the west coast of America, and took share in the examination of the coasts of Columbia, Guatemala, and California, as far as Vancouver Island. On the return of this expedition to England, Lieut. Wood was promoted to the rank of Commander; and in 1855 was given charge of the survey of the n.w. coast of Scotland, and some of his plans of the Isle of Skye have been exhibited before this Society.

The climate of the North of Scotland proved too severe for a constitution weakened by exposure for many years under a tropical sun; his health gave way, and he rapidly sank on the 12th April of the present year, at the early age of 47. In the Admiralty Charts of Africa, America, and the North-West Coast of Scotland he has left a name that will long be gratefully remembered by the mariner who has to navigate those coasts.

In addition to the above names, the Society has to regret the loss of the Earl de Grey, the Rev. Temple Frere, Arthur Baily, Joseph Bainbridge, George Frederick Dickson, George Reelard Griffith, W. H. Jones, and Charles Lewell, Esqrs.

GEOGRAPHICAL PROGRESS.

In reviewing the progress of geography during the past year, I have adopted the practice of my predecessors, and commenced with an account of the Maritime Surveys of Great Britain; for which, as usual, we are indebted to our energetic associate, Captain J. Washington, the hydrographer to the Navy.

ADMIRALTY SURVEYS.

The Coast surveys in course of execution, under the orders of the Admiralty, both at home and abroad, have made steady progress during the past year. They are conducted, under the able direction of Captain Washington, by twenty different surveying parties, one-half of which are employed on the coasts of the United Kingdom, the remainder in the colonies of Australia, Cape of Good Hope, West Indies, Nova Scotia, St. Lawrence, and Vancouver Island; also on the coast of Syria, in the Turkish Archipelago, in Banka Strait, China, and Japan.

England.—On the east coast of England the work has been confined to inserting in the charts the few topographical changes that have occurred in the rivers Tyne, Humber, and in Yarmouth Roads, in the Orwell and Thames, and in Dover Road. In the Tyne the changes have been caused by the opening of docks, owing to the increase of traffic and to some most praiseworthy deepening of the river by dredging by the River Commissioners, by which 400,000 tons of soil, and consequently of obstruction, have been removed from the bed of the river during the past year: a work that cannot fail

to be beneficial; the piers, too, at Tynemouth have made some progress. In the Thames the Conservators of the river have done great good by deepening the shoals in Blackwall and Barking Reaches, thereby removing the obstacles that prevented vessels coming up into the Pool at all times of tide. Dover Bay has been carefully re-sounded by Mr. E. K. Calver, R.N., for the first time since the erection of the pier, which has now reached a length of 1200 feet from the shore, having its outer end in 7 fathoms at low water. The result of the sounding is that a slight scour of the bottom has taken place on the inshore portion of the bay and the soil deposited farther out,—a natural result of the eddy, caused by extending a pier nearly at right angles to the direction of the tide-stream. In other respects the change is inappreciable.

On the south coast, in the neighbourhood of Portsmouth, Southampton Water, and the Isle of Wight, Mr. J. Scott Taylor, R.N., has inserted in the charts the changes that have occurred during the last twelve years, or since Captain Sheringham's elaborate survey of that region in 1848.

In the Channel Islands Commander Sidney and Messrs. Richards and Taylor have corrected portions of Alderney and Guernsey and the outlying banks and dangers; they have also sounded the remarkable dyke in the bed of the Channel, about half-way between Portland and Alderney, known by the name of Hurd's Deep, and found it to extend considerably farther to the south-west than was before supposed. Its length within the 50-fathoms edge is 40 miles, its breadth $1\frac{1}{2}$ miles, and its greatest depth 72 fathoms.

On the coast of Devon Commander Cox with Messrs. Usborne and Davis have completed 12 miles of open sea-coast, 32 miles of harbour coast-line, and sounded over an area of 60 square miles. Off the Land's End and in the Scilly Islands Captain Williams and Mr. Wells, R.N., have filled in the soundings over a space of 650 square miles, in the course of which they discovered some rocky ground, the spot of least depth 8 fathoms, lying 12 miles N. by E. $\frac{1}{2}$ E. of Cape Cornwall, not before noticed. A chart of the Channel, in 3 sheets, on the scale of 0·15 of an inch to a mile, has been published at the Admiralty during the past year.

In the Bristol Channel Commander Alldridge, Messrs. Hall and William Quin have completed the surveys of the eastern half of Swansea Bay, including the Neath river and Port Talbot, in the course of which work they sounded over an area of 67 square

miles. In this vicinity a chart of the coast of Wales, from St. Ann's Head to St. Bride's Bay, including Broad Sound, a plan of the port of Bridgewater, and Barnstaple and Bideford Creeks, on the scales respectively of $3\frac{1}{2}$, $2\frac{1}{2}$, and $1\frac{1}{2}$ inches to a mile, all by Commander Alldridge and his staff, have been published at the Admiralty during the past year. Between the Bristol Channel and the Solway Firth Mr. E. K. Calver, R.N., with his assistants Messrs. Inskip and Davison, has revised the charts and prepared for publication the sailing directions of the West Coast. The plan of Holyhead Refuge Harbour, sounded by Mr. Calver last year, has recently been published at the Admiralty on the scale of 12 inches to the nautic mile.

Scotland.—In Argyleshire Commander Bedford, with his assistants, Commander Creyke and Mr. Bouchier, R.N., have completed the survey of Mull, including the soundings of Lochs na Keal, Scriodan, and Buy; also of Loch Etive on the Main, and about 20 miles of Linnhe Loch leading to the Caledonian Canal. In mentioning the names of these officers at the last Anniversary, it was accidentally omitted to be stated that, during the autumn of 1858, they, at the instance of the Refuge Harbours Commission, re-surveyed Peterhead and Fraserburgh Bays in a prompt and efficient manner, and their surveys have since been published at the Admiralty on the scale of 12 inches to the nautic mile. In Inverness-shire Commander Wood has accomplished 37 miles of the south coast of Skye, thus completing the survey of the island,* and Mr. Jeffery has pushed forward his work in Lochs na Nuagh and Ailort, having mapped 41 miles of the coast.

In the Hebrides Captain Otter in the *Porcupine*, with her tender the *Seagull*, Lieutenant Chimmó, aided by his staff of Lieutenants Dent and Hawes and Messrs. Stanley and Grey, have examined several lochs, with a portion of the west side of the island of North Uist and the Monach Isles, and have sounded over a large area of the Little Minch.

In Harris Commander Thomas, with his assistants Messrs. Morrison and Sharban, have surveyed Loch Resort and a part of

* I regret to say that this was Commander Wood's last work. His long services on the West Coast of Africa with Admiral Fitzwilliam Owen, and on the north coast of America with Captain Kellett, told at length upon his constitution, and after a short illness he died on the 12th April, 1860. The mariner who frequents this stormy portion of the Coast of Scotland will have cause to remember with gratitude the name of James Wood.

Scarpa island, and the plan, on the scale of 6 inches to a mile, exhibited at one of our evening meetings, has justly elicited much approbation. This officer and Lieutenant Chimmo have very creditably continued their meteorological observations in the Hebrides, which are valuable from the paucity of such data connected with those regions hitherto available. Some charts of these coasts have been published by the Admiralty during the past year, as the north-west coast of the Isle of Mull, on the scale of $1\frac{1}{2}$ inches, and Lochs Alsh and Duich, in Inverness-shire, on the scale of 3 inches to a mile; Loch Scriedan, too, is in the hands of the engraver.

Ireland.—On the east coast of Ireland Messrs. Hoskyn, Aird, and Yule have surveyed the dangerous coast between Strangford and Belfast Loughs, and a portion of the interior of Strangford Lough and Narrows. In Donegal, on the north-west coast, Captain Bedford and Lieutenant Horner have added some off-shore soundings to their charts and completed this portion of the coast. Off the south-west coast Commander Edye and Mr. McDougall have sounded the approaches to a distance of 30 miles off-shore, and determined the 100 fathoms-edge of soundings,—a valuable aid to a ship closing the coast of Ireland in a fog.

In the course of the past year several new charts of the coasts of Ireland have been published by the Admiralty, viz. from Ballyhoige to Ballinskellig Bay, on the scale of $\frac{1}{2}$ inch; Achill Head to Roonagh Head, scale $1\frac{1}{2}$ inches, by Commanders Beechey and Edye; Roonagh Head to Doaghtry Point, Ballynakill and Killary Bays, and Clifden and Mannin Bays, Inishbofin and adjacent coast of Galway, Shoophaven, Slyne Head and parts adjacent, Sligo and Ballysadare Bays, all on the scale of $3\frac{1}{2}$ inches to a mile; also Donegal Bay and Sligo and Killala Bays, on the scale of $1\frac{1}{2}$ inches; and all from the surveys of Captain Bedford and his assistants. They form an important contribution to hydrography.

France. Fourteen sheets of the west and north coasts of France, from the Minster to Ushant, and thence to Dunquerque, and seven sheets of the south coast from Palamos to San Remo, on the scale of $\frac{1}{2}$ an inch, have also been published, as well as several special plans of harbours and roadsteads, all from that admirable work the 'Pilote Français,' which reflects high honour on M. Beauteemps Beaupré and all the Ingénieurs Hydrographes engaged on it.

Spain.—A new chart of the north coast of Spain, from the Bidas-

soa to Cape Finisterre, on the scale of $\frac{1}{16}$ th of an inch, has just been published at the Admiralty, as also a Plan of the Port of Santander. It is hardly credible that an error of 11 miles in longitude, in some places near Bilbao, on this coast, has up to this time existed in all the maps of Spain published in this country. This part of Spain becomes of greater interest at this moment, as the immediate neighbourhood of Bilbao and Santander is one of the best positions to view the total eclipse of the sun of the 18th of July, and it is to these places, I am informed, the greater part of the English astronomers propose to go.

Mediterranean.—The Moro-Spanish war has led to the publication of a chart of the Strait of Gibraltar, from an excellent survey by the late M. Vincendon Dumoulin, on the scale of $\frac{1}{70}$ ths of an inch. On it the correct features, with the lofty summits of Monte Picachos, rising 2430 feet, on the Spanish shore, and Apes' Hill, 2800 feet, on the African shore, and the comparatively shallow depths of that remarkable strait are for the first time truly represented, the greatest depth being 510 fathoms or 3060 feet. Also a plan of Ceuta and the adjoining coast to Tetuan, on the scale of $3\frac{1}{2}$ inches, on which is laid down the new boundary, as defined by the Treaty of the 26th of April, 1860, beginning at Khandak Rahmah, or the Ravine of Mercy, on the north, and circling round the eastern foot of Jebel Musa or Apes' Hill to the Wad Uyats on the south. The Moorish coast, with the territory of Riff, is likewise shown in a chart extending from Ceuta to the Zafarin Isles, on the scale of $\frac{1}{3}$ th of an inch to a mile.

In the Turkish Archipelago Captain Spratt, Lieutenant Wilkinson, and the assistant-surveyors, in H. M. S. *Medina*, have brought to a close the survey of the Island of Candia or Crete, and we now have, for the first time, a correct representation of that beautiful island with its lofty central summit of Mount Ida—or, as now called, Psiloriti—towering to the height of 8060 feet; and we now learn the exact position of, and the degree of shelter which was afforded by the bay known in Scripture under the name of the Fair Havens, Kaloi Limnes of the Greeks, in which the vessel bearing the apostle St. Paul on his eventful voyage to Rome took refuge. You will be gratified to hear that the special approbation of the Lords Commissioners of the Admiralty has been conveyed to Captain Spratt, C.B., Commander Mansell, Lieutenants Wilkinson and Brooker, and Mr. Stokes, all of whom bore a part in this survey

for the skill they have evinced in producing this fine specimen of topography.

On the coast of Syria Commander Mansell, in H. M. S. *Firefly*, with his assistants Lieutenant Brooker and Messrs. Skead and Millard, have completed the drawings of the Gulf of Iskanderún, and made plans of Ayas, Latakíyah, and Beirút, all of which are in the hands of the engraver and the plans about to be published. While on the subject of Syria and Palestine, a country in which all must feel a special interest, I trust that I shall not be considered tedious if I say a few words as to the opportunity afforded by the nautical survey of the coasts now proceeding under the orders of the Admiralty for correcting the topography of the interior, for fixing the position of some of the most remarkable places, for measuring the heights of some of the principal mountains, and for the identification of places of Scripture interest.

How, too, is that admirable work the 'Dictionary of the Bible' (the first volume of which, ably edited by Dr. Smith, has recently appeared) to be completed, unless we, as geographers, contribute our share towards its perfection?

Many of our countrymen annually visit the Holy Land, and have a vague impression that there are numerous points of interest to clear up, but the very number appals them, and they do little or nothing. But if one or two special points were placed before them, according to the part of the coast they might start from, it is not improbable that they would fix their attention on those points and aid materially towards clearing away the difficulties that may attach to them.

The subject appears to divide itself into the following heads:—

1. The accurate determination of the position of important cities, mountains, &c.
2. The production of exact topographical plans of places of interest.
3. The identification of sites with Biblical history.
4. The examination of sites with reference to some special object, as the deciding between two conflicting traditions.
5. Points connected with the manners and customs of the natives which would elucidate Bible history.
6. Natural productions of any special parts of the Holy Land which would illustrate Biblical description.

7. Points connected with language, traces of ancient names, correct pronunciation of particular names, and, as far as possible, correct and uniform orthography.
8. Careful drawings of buildings and copies of inscriptions.
9. Traces of volcanic or other remarkable geological phenomena.
10. An examination and comparison of the tombs throughout Syria and Palestine.

A few examples may be cited in explanation of the above.

1. As to Geography:—

From Beirút chronometers and barometers might, without much difficulty, be carried to the Cedars, to the summit of Lebanon, to Ba'albek, and to Damascus, returning by Mount Hermon to the coast at Sidon and Beirút, where the error and rate of the chronometers could be again ascertained.

Another journey might be made from Akkah to Mount Carmel, Tiberias, Genesareth, Mount Tabor, Nazareth, returning by the plains of Esdraelon or Jezreel and Megiddo to Cæsarea on the coast.

Also from Yaffa to Shechem, Mount Gerizim, Samaria, Bethel, Jericho, Dead Sea, Jerusalem, Bethlehem, Hebron, and so to Gaza on the coast.

Seetzen, Burekhardt, Robinson, Lynch, Scott, Symonds, Porter, Van de Velde, Poole, Cyril Graham, Stanley, *etc.*, have done much for the geography of the Holy Land; but no one knows better than these later travellers how much yet remains to be done before any approach to accuracy can be attained. Damascus floats east and west some 14 miles in longitude; Gaza, although close to the coast, is half that amount, probably, in error in *latitude*.*

The heights of cities and mountains are equally uncertain: Damascus and Jerusalem vary between 2200 and 2600 feet above the level of the Mediterranean; Ba'albek between 3550 and 4160 feet; Bethel from 1880 to 2400 feet; Shechem from 1460 to 1860 feet; the Mount of Olives from 2100 to 2700 feet; and lastly, Mount Hermon from 7000 to 10,000 feet. Here is ample work for more than one travelling geographer.

2. Topographical plans of places of interest, as Shechem, Nazareth, Jericho, Bethlehem, Hebron, &c.

3. Identification of site, as Bethabara, the place of our Lord's

* Some notices of the travels of the energetic Professor Wallin of Finland, in the East, are given in former volumes of our Transactions.—ED.

baptism, Mahanaim, Peniel, the forest of Ephraim, Pishgah, &c., in the mountains east of the Jordan.

The above instances suffice to show the character of the information sought.

If, then, those who take an interest in the Holy Land, and are willing to aid in the above proposal, will be so good as to transmit to the Hydrographer of the Admiralty the precise points which they consider require investigation (with a reference to the works in which the respective subjects have already been best discussed), I am authorised by him to state that the questions will be printed, sent to the surveyors on the coast, and circulated as widely as possible in the Levant, with the hope of obtaining useful answers.

Deep-Sea Soundings.—Before quitting the coasts of Europe, I must refer to the valuable line of deep-water soundings made by Commander Dayman in the summer of last year, from the entrance of the Channel across the Bay of Biscay, along the coasts of Spain and Portugal, and through the Strait of Gibraltar and the Mediterranean Sea to Malta. In crossing the Bay of Biscay on this line the descent from what may be termed the British Isles bank to deep water is very rapid, six times more so than off Valentia. Within 30 miles of the 100-fathoms' edge a depth of 1900 fathoms was obtained, and the greatest depth reached was 2625 fathoms. In the Strait of Gibraltar the soundings generally confirmed those obtained by the French survey of the Strait before alluded to, and the greatest depth was 510 fathoms; but a remarkable shoal spot of 45 fathoms was found about 8 miles N.N.W. of Cape Spartel in Morocco, nearly in a line joining that Cape with the coast of Spain at Cape Trafalgar—a feature in this part of the ocean, we believe, hitherto unknown. In the Mediterranean the depth in no part exceeded 1700 fathoms; and near Cape Bon, between Sardinia and Malta, deeper water was found than has yet appeared in any chart of that region. Physical geographers cannot but feel gratified that the requirements of submarine electric telegraphy conduce so much towards a better acquaintance with the bed of the ocean, of which we are still so ignorant.

Nor should I omit some notice of an expedition which is about to be despatched, to carry a line of deep-sea soundings from Scotland to the Faröe Isles, thence to Iceland, Greenland, and Labrador, with the hope of finding a route for the North Atlantic telegraph cable, where the relays shall not exceed 600 miles in length. The expedition will be commanded by our Medallist,

Captain Sir Leopold M'Clintock; while his companion in the late Arctic voyage, Captain Allen Young, with another Medallist, Dr. Rae, will follow in the *Fox* yacht to examine the coasts more in detail. As geographers, we must heartily bid them "God speed."

South Africa.—In the Cape Colony Mr. Francis Skead, R.N., Admiralty Surveyor, has corrected the general positions in False Bay and discovered two shoal spots lying about one mile to the south-west of the Cape. It is gratifying to be able to announce that on the first day of this present month of May, a bright light, revolving once a minute, at an elevation of 816 feet above the sea, and visible for a distance of 36 miles, has at length been exhibited on Cape Point. It seems extraordinary that this remarkable cape, so celebrated in the annals of navigation, first seen by the Portuguese navigator Bartolommeo Diaz in 1486, and first rounded by another equally famous Portuguese, Vasco de Gama, on the 20th of November, 1497, should for three centuries and a half have remained without a light to mark the turning-point in the high-road to India, China, and the East.

Banka Strait.—A new survey of this strait has been completed by Mr. Stanton, R.N., and his assistant Mr. Reed, in H.M.S. *Saracen*, in the course of which it has been discovered that a much better channel exists than has hitherto been in use. The chart of it has been immediately published, on the scale of a quarter of an inch to a mile, and is in general circulation. In the gulf of Siam six of the coast sheets on the same scale, resulting from the survey of Mr. Richards, R.N., have been published during the past year. Two sheets also of the west coast of Sumatra, on the scale of $\frac{1}{16}$ th of an inch, with 20 plans of anchorages, from surveys by Dutch officers, have also been recently published at the Admiralty.

China.—The requirements of the war have led to the publication of a general chart of the coast of China, from Hongkong to the gulf of Pechili, on the scale of $1\frac{1}{2}$ ths of an inch to a degree. Three sheets also of the Si Kiang, or West river, on a scale of $\frac{1}{7}$ ths of an inch to a mile, from a sketch survey by Lieut. Bullock, R.N., have been published, and also three corrected sheets of the Canton river, on a scale of 3 inches, and Wusung river, by Commander Ward and staff, on a scale of 3 inches to a mile. A map of the north-eastern provinces of China, from Chusan to the China Wall, on the scale of $\frac{1}{16}$ ths of an inch, and another of the country between the gulf of Pechili and Peking, on the scale of $\frac{1}{8}$ ths of an inch, have also been prepared from the best available documents by Mr. Edward J. Powell,

of the Hydrographic Office, and published by the Admiralty. In the event of a march by the allied forces on Tien-tsing or Peking, this latter map cannot fail to prove useful. We have received from our associate, Major W. S. Sherwell, Deputy Surveyor-General of India, a map of the China coast, from the Canton River to the Gulf of Pechili, with a rough outline of the provinces between Canton and Peking; several valuable remarks and statistical tables are engraved on the map, which was published, on a scale of 24 miles to an inch, at Calcutta, November, 1859.

Tartary.—Commander Ward and his staff, Messrs. Kerr, Blackney, Farmer, and Bedwell, in the *Actæon*, with Lieutenant Bullock and Mr. Ellis, in the *Dove* gunboat, have made good use of their time on the coasts of Tartary, Korea, and Japan. To the north we have a survey of the bay of St. Vladimir; in Manchuria, of Seau-wuhu bay, Observation spot, on the north-east side of the bay, being in lat. $42^{\circ} 54' 14''$ N., long. $133^{\circ} 50' 32''$ E.; in Korea Tsan-liang-hai harbour (the Chosan of Broughton in 1796), in which the north point of Deer Island is in lat. $35^{\circ} 6' 6''$ N., long. $129^{\circ} 1' 49''$ E.; and lastly, a survey of a magnificent sound, that divides the island of Tsu-sima into two parts. The above plans are on the scale of 3 inches to a mile, and they will be engraved and published on a suitable scale in the course of the present year, illustrated by some characteristic sketches in Korea and Tartary by Mr. Bedwell, R.N. These are positive acquisitions to the geography of little known coasts, such as it seldom falls to our lot to have to record, and they reflect great credit on the officers who, in spite of many difficulties, have persevered in accomplishing them.

Australia.—Captain Denham, in H.M.S. *Herald*, with his staff, composed of Lieutenant Hutchinson, Messrs. Smith and Wilds, masters, and Messrs. Hixson and Howard, second masters, have cleared away numerous reported dangers, and defined the limits of several reefs and banks in the Coral Sea during the past season. However important these new positions are, it is not necessary to enumerate them here, as besides having been published immediately on reaching the Admiralty, and being inserted in the Admiralty charts, the notice of them has been reprinted at Sydney, at the Cape of Good Hope, and in the United States, and thus within the space of three months from their discovery, the whole civilized world was furnished with the means of correcting their charts of this much frequented route, which connects Sydney with Torres Strait, India,

and China. The coasting charts, twelve in number, on various scales, published by the Trinity House, Adelaide, under the directions of B. Douglas, Esq., and accompanied by sailing directions, will be duly appreciated by mariners visiting those parts of Australia. In Tasmania, Mr. Smith, R.N., of H.M.S. *Herald*, has made a plan of Hobarton, on the scale of 6 inches to a mile, which will be immediately engraved and published. The map of Tasmania, in four sheets, scale $\frac{1}{112,500}$, or about 5 miles to an inch, by James Sprens, Esq., Surveyor-General, is coloured to distinguish the counties, gives soundings, and is apparently the largest and best map published.

British Columbia.—The surveying party, under our associate Captain George Richards, in H.M.S. *Plumper*, consisting of Messrs. Bull and Pender, masters, Lieutenant Mayne and Mr. Bedwell, second master, have, as usual, worked most industriously during the past season. They have surveyed Pitt and Frazer rivers, with the magnificent opening of Burrard Inlet, which carries water deep enough for a line-of-battle ship, up to within 3 miles, overland, to the site of the capital, New Westminster. Also parts of the east coast of Vancouver Island, with the adjacent channels, in the course of which they have examined 700 miles of coast, while Lieutenant Mayne has explored 500 miles of the Upper Frazer. They have sounded thoroughly over 420, and partially over 400 square miles, the greatest depth between Vancouver Island and the main being 230 fathoms. The coast line has been laid down on the scale of 3 inches, plans of harbours and Frazer and Pitt rivers on 6 inches, and Victoria harbour on 24 inches to a mile. Mr. Bedwell has contributed also some very characteristic sketches of scenery in these regions.

Canada.—In the St. Lawrence survey Commander Orlebar divided his staff of assistants into two parties; Commander Hancock, with Messrs. Desbrisay and Carey, having re-examined the river between Montreal and Quebec, and inserted all the changes consequent upon the improvements carried out by the Montreal Harbour Commissioners; while Commander Orlebar, with Mr. Clifton, returned to the coast of Labrador and the Strait of Belleisle, where several positions were redetermined, and numerous soundings taken. In the course of the survey 370 miles of coast were re-examined, and 1430 linear miles of soundings run. The charts of the Upper St. Lawrence, in twelve sheets, on the scale of 2 inches to a mile, are in the hands of the engraver, and will be published in July.

The sheets of the gulf and of the river below Quebec have all been revised and corrected in longitude according to the most recent determinations. The sailing directions by Rear-Admiral Bayfield also have been revised, and the third edition is just complete. In Cape Breton Island and Nova Scotia the following charts and plans have been recently published by the Admiralty:—Louisburg Harbour, on the scale of 4 inches; Nicomtau Bay, on 3 inches; Caraquette and Miscou, on $1\frac{1}{2}$ inches; and Little Bras d'Or, &c., on $\frac{1}{16}$ ths of an inch to a mile; and thus the squadron that is to accompany H.R.H. the Prince of Wales to visit Nova Scotia, New Brunswick, Prince Edward's Island, and Canada, will be furnished with the most recent charts and sailing directions that this country can produce.

Bay of Fundy.—Captain Shortland, with his staff, Lieutenant Scott and Messrs. Pike, Scarnell, Mourilyan, and Archdeacon, has been chiefly employed at the upper end of the Bay of Fundy, where they have examined 60 miles of open coast, and 120 miles of river and harbour shores, sounding over an area of 290 square miles. An important service has been performed by Captain Shortland in determining the limits of Le Have bank, which lies to the southwest of Cape Sable, and now that it is correctly laid down on the charts it will be useful in making the land in a fog, if vessels will only be induced to use their lead and carry a line of continuous soundings.

West Indies and South America.—A very creditable chart of the island of Grenada, on the scale of 2 inches to a mile, has been completed by Mr. Parsons, R.N., and his assistants, and they are now at work on the Grenadines, and proceeding to the northward to the isle of St. Vincent.

A fifth edition of the second volume of the South American Sailing Directions by our Medallist, Captain (now Rear-Admiral) Robert FitzRoy, thoroughly revised and much added to by Mr. Hull, R.N., has just been published at the Admiralty: it comprises the coast from the south point of the Rio de la Plata, through Magellan Strait and round Cape Horn to Valparaíso, Guayaquil, and Panama. A plan of Choiseul Sound and Bodie Inlet in the Falkland Isles, in the South Atlantic, on the scale of $1\frac{1}{2}$ inches to a mile, has also been published during the past year.

Variation.—My predecessor in this chair, in his Address of last year, had occasion to notice with approbation the Variation Chart of the world compiled by Mr. Frederick J. Evans, R.N., of the

Compass Department of the Admiralty. This officer has since followed up the work by collecting the deviation tables of all iron ships in Her Majesty's service and the *Great Eastern*, whence he has been enabled to arrive very nearly at the laws which govern these anomalies in our compass-cards, and has prepared a valuable paper on the subject, which it is understood will soon appear in the *Philosophical Transactions*. Your late President in the same paragraph of his Address went on to urge the necessity of great caution in marking accurately on our charts the existing variation, and making allowance in shaping a course for its rapid change in some localities, pointing out that an error of a quarter of a point of the compass in a run of 500 miles would amount to 25 miles. Surely his words must have been prophetic! A few months had hardly elapsed before the iron screw steamer *Indian*, by neglecting this very caution in the short distance of 300 miles from Capé Race towards Cape Sable, ran upon the reefs upon the coast of Nova Scotia, at a spot full 40 miles out of her proper course, and became a total wreck. Let me again then urge on all engaged in the preparation of charts that they look most carefully to the variation of the compass and to its rapid change in certain localities.

Besides the surveys above enumerated as in progress in different parts of the world, the labours of the Hydrographic Office during the past year have consisted in the publication, under the immediate superintendence of Mr. Michael Walker, Chief Draughtsman, of about 80 new and corrected charts of various coasts and plans of harbours, some of which have been already mentioned. The number of Admiralty charts printed has been 148,000, of which 120,000 have been sold to the public. In addition to these have been published the usual annual lists of the 2000 lights spread all over the globe; Notices to mariners of new lights; hydrographic notices of new rocks and shoals discovered; Tide Tables for the British Isles; the time and height of high water for the principal ports in the world; and some 200 corrections in Raper's Tables of Maritime Positions, chiefly in Newfoundland, St. Lawrence, British Columbia, Manchuria, the Eastern Archipelago, and Australia.

TOPOGRAPHICAL DEPARTMENT OF THE WAR OFFICE.

Our Associate, Colonel Sir Henry James, R.E., has favoured me with an account of the department under his charge, which I have much pleasure in laying before the Society. It is divided into

two distinct branches, viz., the Ordnance Survey of the United Kingdom, and the Topographical and Statistical Dépôt of the War Office: previously to the year 1857 they were superintended by officers who were quite independent of each other, but since then they have been formed into one Topographical Department, and placed under Colonel Sir Henry James as Director.

Ordnance Survey.—A Report of the progress of the department during the year 1859 has been laid before Parliament, and from this Report we are able to state the exact progress which has been made in the Ordnance Survey up to the present time. And first, as regards the great trigonometrical operations of the survey, we learn that the principal triangulation and the principal lines of levelling in Ireland have been already published, and that the principal lines of levelling in Great Britain are in the press, and will be published this year, and complete this great branch of the work which commenced so long ago as the year 1784 under General Roy.

Along these principal lines, which are laid out as a network over the whole country, broad arrows, or the Queen's marks as they are sometimes called, have been cut upon the churches, bridges, and other permanent structures, as the exact points to be found on the ground to which the levels refer; and as the heights of these points are all given in reference to the level of mean-tide at Liverpool, they form accurate definite points of reference for those who are engaged in any great engineering operations, such as the laying out of railways, roads, canals, or the drainage of extensive districts, as well as points of reference for connecting the levelling taken within these lines in the execution of the Ordnance Survey.

It will be remembered by all who have taken any interest in the progress of the Ordnance Survey, that after the 1-inch map of England and Wales had advanced from the Land's-end to the borders of Yorkshire and Lancashire, the survey of Great Britain was suspended, that the survey of Ireland might be taken up on the scale of 6 inches to the mile; and that after all the plans of Ireland had been published on the 6-inch scale, the surveys of England and Scotland were resumed. After much discussion on the subject, and the appointment of a Royal Commission under Lord Wrottesley, it was definitely settled that the scale for the large plans of the cultivated districts should be the $\frac{1}{25,000}$, or 25·344 inches to a mile; that the scale for the large uncultivated district

should be the 6-inch scale; and the plans on the 25·344-inch scale reduced to the 6-inch scale, to make the county plans uniform on one scale; and again reduced to the 1-inch scale to complete the 1-inch map of the United Kingdom.

The work of making these reductions, which was formerly a tedious and expensive operation, has been so simplified by the introduction of photography for the purpose, that the whole series of plans now produced do not cost more, if, indeed, quite so much, as the 6-inch plans of Ireland formerly did.

The Report then details the progress which has been made in the survey on these scales in England, Ireland, and Scotland; and we learn that as regards England, the six northern counties, viz., Yorkshire, Lancashire, Durham, Westmorland, Cumberland, and Northumberland, will be finished within this financial year. The plans of the last two counties are now in course of publication, and large parties of surveyors are employed in completing the survey of them; that of the 1-inch map of England and Wales will also be nearly finished this year.

That the 6-inch maps of Ireland have all been reduced to the 1-inch scale, and that they will all be engraved in outline in the present year, although some time must elapse before all the hill-features are sketched and engraved upon them. More than one-third of the hill features are, however, already sketched, and several sheets engraved with the hill features on them; and as the director of the survey will soon have the draftsmen engaged at present on the north part of England available for the completion of this work, we may confidently anticipate an early completion of the 1-inch map of Ireland also.

In Scotland we find that all the southern counties have been surveyed on the large scale, and that the survey is now proceeding in the counties of Perthshire and Forfarshire, and that a considerable portion of these counties has already been finished and published. The counties of Dumbarton, Stirling, and Clackmannan, were finished during the last year. With the exception of the narrow slip of cultivated country on the eastern coast of Scotland, the surveyors have now before them only the mountainous districts and the islands.

All the plans of the southern counties have been reduced to the 1-inch scale, and several of the sheets have already been published on this scale. Duplicate electrotype-plates have also been taken from some of the original copper-plates, and Sir Roderick

Murchison, Director of the Geological Survey, has published them, with the geological structure of the country represented on them. Captain Washington, R.N., Hydrographer to the Admiralty, is also supplied with the copies of the plans, and with distances and heights, to enable him to connect his hydrographical charts with the Ordnance Survey, and thus the topography, hydrography, and geology, have one uniform accurate basis.

I have referred to the advantage to the survey which the introduction of photography by Sir H. James has produced; it has enabled him to do that which would otherwise have been impossible, that is the production of the series of maps required in any time which could be possibly allowed for the work. And in this last Report Sir H. James has given an account of a method now employed for the reduction and transfer of the maps to copper, zinc, or stone, which is not only applicable to the immediate purposes of the survey, but which will be found of inestimable advantage for the production and printing of fac-similes of any printed or manuscript document, or outline engraving. This discovery is so important, that I think it will gratify the Fellows of the Society if I give a concise account of it.

The fact that a solution of the bichromate of potash becomes insoluble under the action of light is the basis of the operation; and to render this available for the purpose of printing on zinc or stone a highly-intensified negative photograph is first taken with collodion on glass; a sheet of thin tracing paper is then coated with a saturated solution of the bichromate of potash mixed with gum-water; when dried, this paper is exposed in the printing-frame, under the negative, for two or three minutes in the light. The action of the light through the lines or writing makes that part of the composition insoluble, while the remainder remains soluble, and can be removed. To effect this the bichromate positive is laid on a sheet of zinc, previously charged with lithographic ink, and passed three or four times through a printing-press. On taking the paper from the plate the entire surface is uniformly covered with ink; but on submerging the paper in a shallow vessel of hot water with a little gum in it, and gently brushing over the surface with a flat camel-hair brush, all the soluble portion of the composition, with the ink attached to it, is removed, and the outline of the MS. or print is produced quite perfect, and charged with ink, and, when dried, it is at once ready for transfer to zinc or stone or the waxed surface of a copper plate. Sir H. James has called this art Photo-zinco-

graphy; and its value for the purpose of copying and printing at a trifling cost facsimiles of ancient MSS. and rare documents, now locked up and inaccessible to the public, must be obvious to every one.

A specimen of this art is given in the Report on the Survey; and we have seen several others, which leave no doubt either of the importance of the discovery or of the perfection to which the art has already been brought on the Ordnance Survey.

TOPOGRAPHICAL AND STATISTICAL DÉPÔT.

While the operations of the Ordnance Survey are confined to the production of the maps and plans of the United Kingdom, the Topographical Dépôt is designed for the collection of the most accurate maps of our colonies and every part of the world, with such statistical information as bears more immediately upon the military resources of every country.

Within the last year a catalogue has been printed of all the maps, plans of fortified places, and charts which have already been collected in the Dépôt; and the Secretary of State for War, impressed with the importance of making this collection as perfect as possible, has appropriated an additional portion of the grant for this year for the purchase of such maps and plans as are still wanting.

The work of the Ordnance Survey is conducted by the officers and men of four companies of the Royal Engineers and a great number of civil assistants; but for the work of the Topographical Dépôt Sir H. James has the assistance of one officer from each of the following services, viz. Artillery, Engineers, Infantry, and the Navy, the special acquirements of officers from these branches of the service being required for the effective conduct of this branch of the department.

The Report gives a full detail of the great amount of work which is executed in the Dépôt, and which includes the plans of colonies, battles, sieges, &c., as well as the vast number of circular letters and orders required by the War Department.

Among the maps is one of Europe, showing the boundaries of every state as arranged by treaties, with the dates of the several treaties; and on this map the position of every coal-field in Europe is shown, with returns of the produce and nature of the coal in each.

Plans of every barrack and fort in Her Majesty's dominions are

in course of publication, and two volumes have already been published.

Returns of the strength, organization, and equipment of every army in Europe have been compiled from the most authentic sources, and a great quantity of other work which it would be tedious to detail; but some idea may be formed of the extent of the work performed in the Topographical Department, from the fact that 190,000 plans were published during the last year.

The Topographical Department has constantly to furnish officers and men for the surveys of the colonies; and we observe from the Report that, during last year, Lieut. Bailey and a party of Royal Engineers have been sent to the Cape of Good Hope, and other parties to British Columbia, Belize, and Malta.

METEOROLOGICAL DEPARTMENT OF THE BOARD OF TRADE.

In the Meteorological Department of the Board of Trade (and Admiralty), under the guidance of our excellent Medallist, Admiral R. FitzRoy, much has been effected during the last two years by simultaneous observations at many places, in addition to the registration of atmospheric occurrences sedulously carried on at sea and on land in many parts of the world.

Practically, these extensive observations of facts, occurring in various climates and under a variety of conditions, from arctic or antarctic regions to those of the tropics, have directly tended to prove the uniformity of those laws by which our atmosphere is governed and the differences of climates determined.

Meteorology, which had been thought a complicated and vague subject, has approached the character of an exact science; and the tabulated labours of many observers in successive periods of years during the last two centuries have begun to bear fruit in their present usefulness to practical as well as to theoretical students of atmospherical phenomena.

It is now by no means difficult to estimate the climate of any place of which the geographical position is known.

The hours of highest and lowest temperature and barometric pressure, the normal height of the mercurial column, and the prevalence of moist air, rain, or dryness, much or little cloud, &c., can be predicated approximately for any part of the world, although in that particular place no observations may yet have been made.

More than this, however, and more directly valuable, is our confirmed knowledge of the "laws of storms," and our further

acquaintance with the nature and succession of the prevalent or various winds over the earth and ocean.

Consequent on the recorded observations of numerous contributors* to meteorological science, we have now a general and, in some branches, a detailed acquaintance with the subject; we have good instruments and tables, and the use of them is better known.

Her Majesty's Government has endeavoured to diffuse practical knowledge of winds, weather, currents, storms, and climates, not only among mariners engaged in voyages to distant regions, but among the coasters and fishermen along our own shores.

Instruments and instructions have been liberally lent (at the public expense) to selected captains of ships; while other such aids, of a kind expressly suitable, have been similarly lent to more than thirty of the most exposed and least affluent fishing-villages.

The hardy populations of these places have already derived much benefit and have strongly expressed their sense of gratitude for the use of these barometers, thermometers, and plain instructions; while the registers returned from numerous ships among the finest of our merchantmen, besides men-of-war, now constitute a mine of valuable maritime and scientific information.

Among many results indirectly or immediately flowing from the recorded observations on board so many ships thus supplied by Government with reliable instruments, verified at the Kew Observatory, has been one which cannot be too widely known among voyagers,—namely, that near the equator, between five and ten degrees of north latitude, the range of the barometer is so small and so regular, as to time, that any such or similar instrument may be verified, while crossing that zone, more satisfactorily than by a removal to the shore for comparison with a standard, a test also of the utmost value to meteorological records made on long voyages with uncomparated instruments.

Another simple result deduced from multiplied observations, and as important as it is simple, is that in a gale or storm, while facing the wind, the centre of the circling or cyclonic current of the atmosphere is to the *right* in *north* latitude, but to the left in the southern hemisphere.

* Dampier, Halley, Hadley, De Foe, Franklin, Cook, Capper, Flinders, Redfield, Dove, Daniells, Kæmtz, Espy, Sabine, Reid, Piddington, Herschel, and Humboldt, besides many other original observers; and compilers, among whom is the popular Maury.

Not that these rules are without occasional apparent exceptions—apparent rather than real—caused by a second, perhaps even a third cyclonic (or oval) eddy impinging on the first circulation, either horizontally or angularly (with reference to the horizon).

The *first* movement may be likewise more or less inclined to the horizontal plane, if not occasionally almost vertical, as in a “*descending squall*.”

Such phenomena are readily explicable, after due consideration of Dove's theory of polar and equatorial currents (translated and published by the Board of Trade), and they are so marked by “*weather-glasses*” that it is now inexcusable to navigate without them or to undervalue their warnings.

Why the barometer rises and falls, *how* it and its indispensable companion the thermometer are affected by a coming change, are questions often asked by the inexperienced in their use, and may be answered here in a few sentences (from the Meteorological Department) for the benefit of such young travellers or voyagers as have yet the world and its marvels before them.

“Cold, dry air, coming from a polar direction, is heavier in specific gravity than warm, moist air (containing gas or aqueous vapour) flowing from tropical or equatorial regions.

“The normal condition of our atmosphere is a continual rising and westward movement of inter-tropical, or rather *sub-solar*, atmosphere, consequent on its expansion, and being lightened by the sun's action while the earth is rotating on its axis.

“This rise and westward impulse is accompanied by general movement, from polar directions, to fill the space that would otherwise become *comparatively* vacant. Air, like water, seeks equilibrium, but, unlike water, it is *very* elastic and *excessively* mobile.

“Yet air, however rarefied, cannot rise beyond a certain distance. Cold and gravity check its elevation. It must, however, move onwards somewhere. Having momentum, and being pressed behind by ever-rising air, it overflows (as it were) the polar under-currents and moves towards those regions which the polar currents have quitted and are *continually* quitting. But those regions are vastly smaller in area than the equatorial, and opposition, if not a conflict, occurs soon between the main streams or currents, so unequal in breadths and characters.

“Portions of the overflowing quantities from the sub-solar regions combine, between the tropical limits and near thirty degrees of latitude, with the normal and general movement (called trade-

winds or monsoons), and other parts divide, mix with, or oppose the polar currents in a variety of ways, between the tropics and arctic (or antarctic) regions.

“Such currents sometimes flow side by side, though in opposite directions, as ‘parallel streams,’ for hundreds or even thousands of miles.* Sometimes they are more or less superposed—perhaps, or indeed *frequently* crossing at various angles;† sometimes combining, and by the *composition* of their forces and *qualities* causing those varieties of weather that are experienced as the wind veers more toward or from the equator or the nearest pole; and sometimes so antagonistic in their angular collision as to cause those large circling eddies or rotatory storms called cyclones (in modern parlance), which are really like the greater storms in all parts of the world, although they do *not* quite assimilate to those local whirlwinds, dust-storms, and other commotions of atmosphere which are more *electrical* in their origin and characteristics.

“Whenever a polar current prevails at any place or is *approaching*, the air becomes heavy, and the barometer is high or rises. When the opposite (tropical or equatorial) prevails or approaches, the mercury is low or falls, because the air is, or is becoming, specifically lighter, and these changes take place *slowly*.

“Whenever, from any cause—electrical, chemical, or simply mechanical—either current, or any combination of currents, ceases to press onwards‡ *without being opposed*, a *gradual* lightening of the atmosphere, through a greater or less area of hundreds, or perhaps thousands, of miles occurs, not suddenly, but very gradually, and the barometer falls.§

“To restore equilibrium, the nearest *disposable* body of air (so to speak) moves first; but an impulse, at the first time, may have been given to other and greater masses that—though later in arriving—may be stronger, last longer, and cause greater pressure mechanically as well as by combination. Air, like water, mingles but slowly, either from above or laterally.

* Like Sabine's currents of the sea, on the coast of Africa.—‘Pendulum Experiments.’

† Green, Rush, and Welsh.—‘Balloon Ascents.’

‡ If *opposed* mechanical pressure increases; and this may be caused by high land, as well as by opposing wind.

§ Evaporation, rarefaction, or condensation of vapour in air, reduces its specific gravity—the two former by expanding bulk, and rendering it lighter; the latter, through mechanical diminution of quantity, by falling to the earth as rain, &c. Moreover, there is more or less motion, *away* from the place of stationary air, which tends to lessen its elasticity or pressure, and cause the barometer to fall.

"Taking, with Dové, north-east and south-west as the 'wind-poles,' all intermediate directions are more or less assimilated to the characteristics of those extremes; while all the variations of pressure, many of those caused by temperature, and all varieties of winds, may be clearly and directly traced to the operations of two great normal currents—equatorial or tropical, and polar."

Young travellers, and more particularly intending voyagers, may find this subject systematically, though popularly treated, according to the views of Herschel and Dové, in recent publications of the Board of Trade.*

AMERICA.

Arctic.—The award of the Founder's and Patron's Medal to Lady Franklin and Sir L. M'Clintock by the Council of this Society, and their reasons for coming to this conclusion, dispense with my entering into as much detail as would otherwise be required in that portion of my present review which relates to the Arctic regions.

It is no small satisfaction to me, however, to have to record in the annals of the Society, during the year of my Presidentship, such remarkable events as the solution of the fate of the *Erebus* and *Terror*, through the efforts of Captain M'Clintock and his officers, and the revelation of the discoveries of Franklin by the attainment of the only written document which has rewarded the search during a period of twelve years. This document, buried thirteen years ago in a spot so lonely that not even the feet of the wandering Esquimaux ever approached it, has crowned the latest of the Arctic expeditions with a success and a renown which the preceding ones perhaps equally merited, but were not so fortunate as to obtain. In combination with other memorials which fell under the notice of the exploring parties from the *Fox*, this rustworn, tattered, but precious document leads us to believe that our unfortunate countrymen, the pioneers and the martyrs of the last decade of Arctic exploration, perished in the accomplishment of their mission and placed the keystone into that wide arch, built up at intervals during many generations, which connects the Atlantic and Pacific Oceans. In giving to the Franklin Expedition the honour of being the first discoverers of a North-West Passage, it needs not to be explained that there is scarcely an individual name known in Arctic

* Sold at the cost of paper and printing only, by the Government agent, Mr. Potter, in the Poultry, London.

navigation for the last forty years which has not given a helping hand to the solution of this great problem ; but, in speaking of the amount of discovery, it is but fair to state that, out of the 2060 miles which intervene between the discoveries of Baffin from the side of the Atlantic, and those of Cook from the Pacific—in other words, the north-west passage between the two oceans—no less than 1260 miles were explored and navigated under the command of Sir J. Franklin himself, either by boat or ship. In his last fatal expedition, upwards of 560 miles of unknown waters were navigated by the *Erebus* and *Terror*, which vessels, previously to taking up their quarters at Beechey Island for the first winter, pushed their explorations as far north as 77° N. lat., when, having satisfied themselves of the impossibility of finding a passage in that direction, they returned to Beechey Island by a channel to the west of Cornwallis Island, and in the following summer proceeded in the direct execution of their mission by taking a southerly course towards the coast of America, in order, if possible, to obtain a connection with those already known waters extending from Back River to Bering Strait. In the month of September, 1846, they attained a position off the north-west point of King William Island, or, as the Admiralty chart of that day represented it, King William Land, it being supposed to form part of the continent. They were here distant but 90 miles from the channel which had, many years before, been navigated along the coast of North America, and *which it was Franklin's object to enter*. In the following spring, before the navigation was open, a party was detached from the ship to follow the coast-line of King William Land to Cape Herschel, and thus connect the recent discoveries with those of former years. A marginal note of later date, on the same document, records the death of Sir J. Franklin in June, 1847, and the abandonment of the ships in April, 1848, by the survivors, 105 in all, who, under the command of Captains Crozier and Fitzjames, commenced their retreat on the Back River. Beyond the last-named date we have no written evidence of their proceedings. They *must* have been in a state of great debility and disease, dropping one after the other, though some were able to reach as far as Montreal Island in the estuary of the Back River, where remains of clothing and equipment were found, but no skeletons, as upon King William Island.

The labours of Captain M'Clintock and his companions have not only procured for us this authentic information as to the proceedings of the Franklin Expedition, but have added materially to our geo-

graphical knowledge ; 600 miles of new coast-line have been discovered, and the gap completely filled up between the old and the new discoveries along the continent of America, thus enabling us correctly to delineate on our maps the most northern extremity of the New World and supply the deficiency which the absence of any detailed account of the voyage of the *Erebus* and *Terror* has left. Independently of the interest which these exciting discoveries have created in the public mind, the simply-told narrative of Sir L. M'Clintock will remain a standard work among voyages and travels, and the admiration of his gallant conduct in persevering in the object of his voyage after the discomfiture of the first year will remain an example to after ages.

A very interesting addition to the remarkable voyage of Dr. Kane has been recently added by the publication, by Mr. Bentley, of Dr. J. L. Hayes' narrative, detailing the proceedings of a portion of the crew of the *Advance*, which left that vessel in Van Rensselaer Bay in August, 1854, and lived among the Esquimaux for several months. Influential meetings have been held by the different scientific societies in the United States, with a view to raise subscriptions to enable Dr. Hayes to return to the scene of his labours under our lamented Medallist, Dr. Kane, and follow up his explorations towards the Pole. Should a sufficient sum be raised, it is his intention to proceed to Smith Sound this summer, and go to the north along the coast of Grinnell Land.*

Professor B. Silliman, in a letter to Sir R. Murchison, relates that a gentleman from Cincinnati, with *one white* companion and several Esquimaux, intends proceeding in a New London whale-ship in search of a portion of Sir John Franklin's men, whom he believes to be still alive. And our own countryman, Mr. Parker Snow, formerly second in command to Captain Forsyth, in Lady Franklin's discovery ship *Prince Albert*, proposes to make another attempt to ascertain the details of the fate of the lost expedition by renewing the search for those journals, records, and other traces which he expects will be found during an exploration *in summer*, when the ground is free from its winter covering. The proposal has met with the approval of several of our highest Arctic authorities. Mr. Snow hopes to be able to proceed through Bering Strait, and to follow the line along the American continent so successfully adopted by Captain Collinson.

* Dr. Hayes has since sailed from New York.

Mr. Alderman T. Hopkins, in a paper read before us, proposes to reach the Pole, by proceeding to the north, between Spitzbergen and Nova Zembla. He presumes that as Parry met with a southerly current in the meridian of Spitzbergen, a contrary one will be found farther to the east, and, from the prevalence of south-westerly winds, it is his opinion that high land will be found near the Pole.

The scientific expedition proposed by the Swedish Government to explore Spitzbergen and the North has, as our associate, Count Platen, informs us, been postponed until next year, in order to be more fully organised.

Proposed North Atlantic Telegraph.—Though not an Arctic subject—as the line which Colonel Shaffner of the United States proposes to lay the Atlantic telegraph does not come within the polar circle—yet as it is one in which the opinion of officers experienced in ice movements will have great weight, I am induced to place it in this portion of my Address. The difficulty experienced in rapidly transmitting messages throughout a great extent of wire induced Colonel Shaffner to turn his attention to a route by which, in every probability, there will be required no continuous length beyond 600 miles. After a careful investigation at his own expense last year, he believes that he has found suitable places for the termini of the wires in Labrador and Greenland, whence he proposes to lay the cable to Scotland by way of Iceland and the Farøe Islands. Some deep-sea soundings along this route have been obtained which denote a maximum depth of 2000 fathoms, and many of the Arctic navigators are of opinion that the fear of rupture by icebergs may be entirely obviated by a judicious selection of fiords up which the cable may be carried.*

British North America.—Palliser's Expedition.—Accounts have been received from our Medallist, Captain J. Palliser, of the safe arrival of himself and party at Colville on the Columbia River, where, in compliance with his instructions, his explorations cease.† After spending the winter at Fort Edmonton, during which season several arduous journeys were performed on the snow by himself and the Geologist, Dr. Hector, which contributed largely to the geographical results of the expedition, Captain Palliser, having organised his party, proceeded towards

* See page 152.

† Captain Palliser and his scientific companions have since returned to England.

the South Saskatchewan River, following the course of Red-Deer River. By reaching within a few miles of the point from which he turned in his first season's explorations, and thence proceeding westward to the Rocky Mountains, keeping between the South Saskatchewan and the Boundary line, he thus completed the survey of the great and hitherto unknown Prairie region. His Report shows that the arid tract which is known to occupy the centre of the North American continent extends for at least 2° into British territory. The greater portion of the country adjacent to the South Saskatchewan and Red-Deer River he found to be deficient in moisture, and only supporting a very scanty pasture. At the Cyprière Hills, however, which lie about 40 miles north of the frontier line, in long. 111° w., there is abundance of wood, water, and grass.

After thus spending the early part of the summer in completing the exploration of the eastern prairie country, he despatched Dr. Hector to traverse the mountains by a northern route, while, accompanied by the Astronomer, Mr. Sullivan, he himself crossed by the Kutanie Pass to Fort Colville.

From that point Mr. Sullivan explored eastward towards the Rocky Mountains, and describes a succession of transverse valleys by which a road, striking the valley of the Kutanie River by either the Kananaskis or Vermilion Pass, could be continued westward within British territory. At the same time Captain Palliser continued an examination of the country to the west of the Columbia, likewise keeping within British territory, until he met the Boundary Commission and also Lieutenant Palmer, R.E., whose reconnaissance of a trail from Lower Frazer River to Fort Colville has also been laid before this Society. As likewise, by the valley of the Okanagan River, there is known to be an easy communication with the gold mining region, the connection of the Saskatchewan plains east of the Rocky Mountains with a known route into British Columbia may be considered as one of the chief results accomplished by the expedition. Dr. Hector, after leaving Captain Palliser, followed up the South Saskatchewan, and crossed the mountains by a "pass" in the neighbourhood of the 52nd parallel, when, after striking the Columbia and within 60 miles of his exit on Thompson River, his exploration was closed by the advance of winter and the want of provisions, while forcing his way through timber so dense that he could not penetrate faster than from three to four miles a day. He reports, however, that he encountered no physical obstacles to the

construction of road, so far as he explored. The absence of game, and the difficulty of carrying provisions, owing to the luxuriance of the forest growth, appear to render the exploration of the country to the west of the Rocky Mountains an extremely difficult and expensive task.

The results of this most important expedition will in due time be laid before the Society, and published in its Journal.

Hind's Expedition.—Great credit is due to the Canadian Government for the energy with which they have pushed their explorations into the vast region lying to the west of Lake Superior and the country drained by the Winnipeg, Red River, and the Saskatchewan. The reports of the Assiniboine and Saskatchewan expedition under the charge of Professor H. Y. Hind,* introduce us to a large tract of country respecting which comparatively little was known. The great lakes of the Winnipeg basin, embracing a water area exceeding 13,000 square miles, are bounded to the west by the abrupt and precipitous escarpments of the Riding, Duck, Porcupine, and Pas Mountains, which bear marks of their having once been an ancient coast line, when the ocean was relatively 1600 feet above its present level; the low region east of these mountains being the result of denudation. On their western flanks these ranges descend in steps and gentle slopes to the fertile valleys of the Assiniboine and Swan rivers, and are densely wooded with valuable forest trees. The area of arable land of the first quality between the Lake of the Woods and the Grand Forks of the Saskatchewan is estimated by Professor Hind to exceed 11,000,000 acres; and an additional area of equal extent is fitted, even in its present condition, for pasturage.

Wheat and Indian corn have been grown at all the posts of the Hudson Bay Company, and at the missionary stations scattered over this belt of fertile country. Although the low region east of the Riding and Duck Mountains, and partly occupied by the Great Lakes Winnipeg, Manitobah and Winnipegosis, is generally unfit for the permanent habitation of civilized man, yet it has been found to contain an inexhaustible supply of that great necessary of life, common salt. The brine springs occupy a strip of country extending from the 49th to the 54th parallel, and thence towards the valley

* North-West Territory. Reports of Progress; together with a Preliminary and General Report on the Assiniboine and Saskatchewan Exploring Expedition. By Henry Youle Hind, M.A., in charge of the Expedition. Printed by order of the Legislative Assembly, Canada, 1859; also in a Blue-Book, Eyre and Spottiswoode, London, 1860.

of the Mackenzie. In the cretaceous shales, which form the base of the country drained by the Little Souris, and part of the Assiniboine, clay iron-stone of remarkable purity and in great abundance has been found to exist, while on Battle River and the north branch of the Saskatchewan Dr. Hector discovered an abundant supply of lignite coal.

West of Assiniboine the country furnishes limited areas well suited for settlement, but the south branch of the Saskatchewan flows through a region which from its aridity will probably never be generally occupied by civilized man.

A very important and curious feature in the surface of the great prairie-plains drained by the Saskatchewan and the affluents of Red River is the numerous deep river-channels, which cut the country to the depth of 300 and even 400 feet. The most remarkable example is that of the Qu'appelle river and valley, which form a continuous water communication from the south branch of the Saskatchewan at the Elbow to the Assiniboine near Fort Ellice. The entire length of this valley was traversed, partly in canoe and partly on horseback, by Professor Hind's expedition, and instrumental measurements were taken of its leading dimensions. Its least depth is at the height of land, 12 miles from the Elbow of the South Branch; here it is 110 feet deep and one mile broad. From a small lake in this part of the valley, water flows both to the Saskatchewan and the Assiniboine, 257 miles to the east. The narrow lakes in this valley have a depth of 66 feet, and are 57 miles long in the aggregate; the bottoms of the lakes in some instances being about 350 feet below the prairie level. Other communications between the South Branch and the Assiniboine exist besides that of the Qu'appelle valley, showing that the prairie-plains which they intersect have probably been subjected to a slow but continuous process of upheaval, whereby river-courses have been changed and the numerous Elbows originated, which form such a curious feature in the prairie rivers of the basin of Lake Winnipeg.

With a vast area of fertile soil, and a climate favourable to the cultivation and growth of wheat; with lignite coal, iron-ore, and common salt in abundance, a great future is probably in store for the Basin of Lake Winnipeg. Lying between the rich gold-fields of British Columbia* and the powerful, populous, and wealthy colony

* *Vide* Papers relative to the Affairs of British Columbia, Part III. Blue-Book, 1860; and page 155 of this Address.—Ed.

of Canada, it is only a question of time how soon its vast capabilities and resources will be developed, and that position assumed when, as a British colony, it will also become instrumental in carrying British institutions, associations, and civilisation across the continent of America.

Dawson's Expedition.—The expedition under Mr. S. J. Dawson, C.E., undertaken with a view of ascertaining the best route from Fort William to the River Saskatchewan, has resulted in giving us considerable information and several maps of the country.

In a paper addressed to the President and Council of the Society, our associate, Captain M. H. Synge, R.E., who for several years has devoted much attention to this subject, earnestly appeals to the Society in favour of the British North American Route, as shorter, quicker, more favourable as to winds and currents, more salubrious, more comprehensive, inviolable, perfect in its water-communication, and causing the colonization of British North America in great part. Captain Synge briefly adverts to the enhanced value of the project caused by the events of the last few years.

Mexico.—Our learned Corresponding Member, Professor Paul Chaix, of Geneva, has forwarded to us an interesting account of an excursion to an ancient volcano in Mexico, which will appear in the next volume of our Journal.

Central America.—*Honduras Interoceanic Railway.*—From a Report which has recently been published, it appears that the survey has established the following facts—that Port Cortez, on the Atlantic (lat. 15°49' N.) and Fonseca, on the Pacific (lat. 13°21' N.), are both first-class harbours; that across Honduras is a perfectly practicable route for a railway of 220 miles in length to connect those harbours. Mr. Trautwine, the superintending engineer, reports that the result of the survey is the establishment of the interesting and important fact that there exists through Honduras a perfectly feasible route for a railway, with natural harbours at its ocean termini, the existence of which must be regarded as a controlling feature in an enterprise like that proposed, and which derives peculiar importance from the fact, that throughout the entire extent of Central America there occurs no similar instance in combination with a route so favourable as that developed in the survey.* Colonel Stanton, R.E., reports that the harbours are unexceptionable, and that the road can be constructed without any sharper curves or heavier grades than are to be found on existing lines over which locomotives work without difficulty.

* See 'President's Address' for 1859, p. ccviii.

Mr. Maximilian de Sonnenstern, for many years engaged in surveying Central America, is engaged in publishing his map, in four sheets, which will comprise Guatemala, Honduras, Salvador, Nicaragua, and Costa-Rica.

South America : Equador.—Several papers which have been communicated to the Society must not be passed over without the special mention they deserve. Our forthcoming "Journal" will contain the narratives of no less than three travellers who have been engaged in explorations of the State of Equador, namely, of Mr. G. J. Pritchett, who traversed the greater part of it in various directions in the years 1856 and 1857; of Mr. Spruce, a botanist (for whose Journal we are indebted to Sir William Hooker), who, proceeding from Tarapoto, in Peru, to Baños, in the State of Equador, passed down the river Huallaga to the Amazon, and thence, ascending the rivers Pastaza and Bombanaza to Cañelos, visited the great volcanic regions of Chimborazo and Cotopaxi, and the eastern portion of the provinces of Leon and Quito, collecting information regarding the natural products of those countries, which is of great interest; and lastly, of Mr. Jameson, who has resided for many years at Quito as a Professor in the University, and has sent to the Society an account of a tour which he made last year, during one of his vacations, as far as Cayambe.

The narratives of these gentlemen comprise a considerable mass of original information regarding the State of Equador and its natural resources. I may also add that we have received a copy of the map of that Republic, by Dr. Villavicencio, mentioned as in course of publication by my predecessor in his Address in 1858.

Chile.—Mr. Wheelwright's gigantic project of a railway over the Chilian Andes, from Copiapo and across the Argentine provinces to Rosario on the river Parana, an account of which was read before the Society in January last, has led to a survey extending no less than 350 miles over the Great Cordillera of the Andes, and thence across the slopes and plains beyond, to the river Parana, a copy of which, accompanied by sections, has been communicated by Mr. Wheelwright to the Society, and will be found full of interesting matter connected with the climatology, mineral and other products of those hitherto undescribed regions.

The Government of Chile is making progress in extending civilization to the south of that Republic in the direction of Patagonia, among fertile plains occupied by savage people; but capable of supporting large populations, whenever the tide of emigration may set in that direction. In Chile the working of the coal veins

is being greatly extended. This increase of production is of great importance, not only to the steam vessels of all nations frequenting the Pacific, but also to the various copper and silver melting establishments in that productive mineral country.

Brazil, &c.—The railroads now in course of construction from the Atlantic coast into the interior of South America, as at Pernambuco, Bahia, and San Paolo in Brazil, will not only be of benefit to commerce by developing the resources of these vast countries, but also lead to a more accurate and familiar geographical knowledge of them. Our own Captain Sullivan and Captain Page of the United States navy, by their interesting river-exploration have already, as you know, thrown great light on the capabilities of the fertile regions on the western frontier of Brazil as well as of the Argentine provinces.

Patagonia.—H. M. Minister at the Argentine Confederation has communicated to us letters on maps of Patagonia, by Mr. H. L. Jones, which assist in throwing some light on this unexplored region of the world.

Tierra del Fuego.—Since the Admiralty Survey of this portion of South America by Admiral R. FitzRoy, in 1830-36, little has been done to open out its natural resources. Mr. Parker Snow has partially examined the islands in the vicinity of Cape Horn, and found good harbours with fresh water supply, with easy access to vessels, where they might refit any damage sustained in rounding the Horn. A fresh survey of these parts is much needed, to make known its harbours, develop its resources, and bring its yet savage inhabitants in communication with the civilized world.

Falkland Islands.—These islands afford many harbours of refuge, as shown by the surveys of FitzRoy, Robinson, and Sullivan; many parts are fertile and productive. At present Stanley Harbour is the principal Government station, but the missionaries have stations on the western islands.*

AFRICA.

Geographical science has made considerable advance in the African continent since our last Anniversary. The labours of Captains Burton and Speke are published in our Yearly Journal,

* For other mention of these subjects see Captain Washington's lucid sketch of Admiralty Surveys during the past year; and for the important records of geographical progress in the United States of America, I must refer to our Medallist, Professor Bache's Coast Surveys, the Journal of the Geographical Society of New York, and other excellent works published in America.

which is almost wholly occupied with an account of their expedition, from the pen of its leader: so ample in its contents, so rich in observation, so minute in description, as to make us marvel at the energy of the man who, prostrated and half-paralysed with fever and its consequences, nevertheless continued to observe, question, and note down the enormous number of facts therein contained, that elucidate the ethnology and condition of negro society in Eastern Africa.

The result of the careful mappings of Captain Speke is appended to Captain Burton's Paper. Full justice has now for the first time been done to his work. For the astronomical observations have been re-computed by Mr. George at the Society's rooms; the itineraries and bearings have been examined and collated, and his data protracted with the greatest care by Mr. Findlay.

The nature of every-day life among the negroes of Eastern Africa as pictured in numerous lights in Captain Burton's pages, is one that cannot fail to leave a painful impression on all lovers of the human race. It is not only the reckless cruelty of the people that shocks us, nor their slave-dealings nor marauding propensities, nor their degrading superstitions and incurable indolence, for we are fully prepared to accredit any rude race with all or any of these qualities, but it is the picture of one unbroken spread of vulgar, disunited, and drunken savagery over the entire land, connected apparently with fewer redeeming qualities than are possessed by any other race with whom previous travellers have made us acquainted. In fact, it is hard to discover a single trait in East African character, as described by Captain Burton, upon which we are able to dwell with pleasurable recollection. The very features of the land have a repulsive aspect. His description leaves us with the idea of a fever-stricken country that is skirted by a wide, low-lying belt of overwhelming vegetation, dank, monotonous, and gloomy, while it reeks with fetid miasma.

The difficulties in the way of a thorough exploration of this country seem enormous. The porters and servants of an expedition in this land of rude equality are insubordinate, and held together by the slightest possible restraint. They act on impulse, abandoning their loads and decamping at slight temptations, while hardly any inducement can persuade them to violate routine by deviating the smallest distance from the established track. The tyranny of custom, as well as the tyranny of brute force, is established in these lands with a power that we, nurtured in freedom, find it hard to conceive.

The distribution of races throughout Eastern Africa is a subject on which Captain Burton has given us a large mass of material. The time is however hardly ripe for a full examination of this subject. Other expeditions are in progress, to which we shall shortly refer, from whose joint results, together with what is now before us, we may hope soon to learn with tolerable accuracy the broad features of the ethnography of Africa. Whether, for instance, the South African races are or are not separated by a sharp line of demarcation from those of North Africa; and again the number and direction of the chief lines of ancient migration. Captain Burton shows some cause to connect the appearance of the Caffre races in South Africa with the pressure exerted in the interior by the first spread of the great kingdom (now utterly broken up) of the Wanyamesi.

Most of what we positively know of the physical features of the land in question is to be seen at a glance in the map. We there trace the route of the expedition, its sectional elevation, and a part of the shores of the two lakes Tanganyika and Nyanza, the former of which was partly navigated, the latter only reached by the expedition. We do not know from the certain evidence of the eye-witness of our travellers what the affluents of the former lake really are, nor whether it has any outlet. Neither of the two ends of the Tanganyika were visited owing to the want of proper boats and the obstruction of the natives. We have in consequence no better authority than that of native testimony for the tributaries represented as entering the lake at its northern and southern extremities. The configuration of the country to the northward gives us excellent reason to believe that the northern tributary is correctly described; but whether the river mentioned as *entering* the lake at the south does not really run *out of it* is a fair matter for discussion.

It is indeed a strange hydrological puzzle if a lake, situated in the damp regions of the equator, subject to a rainy season that lasts eight out of the twelve months of the year, and supplied by considerable rivers, one of which is stated to be saline, should have no outlet ~~whatever~~, and yet retain its elevation unchanged, its evaporating area invariable, and also the sweetness of its waters uncompromised. We may speak to much the same effect of the lake Shirwa, lately visited, but not yet thoroughly explored by Dr. Livingstone. To make the matter more strange, we find the Nyassa lake closely adjacent to the Shirwa, and not far distant from the Tanganyika, and of approximately the same elevation, gives exit to a splendid river, the Shiré, which Livingstone describes as

being at its outlet 150 yards broad, 10 to 12 feet deep, and running at $2\frac{1}{2}$ knots an hour. Lastly, there is this farther unexplained peculiarity, that, contrary to the Zambesi, and to the properties of all rivers in Tropical Africa, the variation in the height of the Shiré in the wet and dry seasons does not exceed the remarkably small amount of 2 or 3 feet.

Now if we venture to disregard native testimony altogether on that one point in which native testimony is perpetually misleading travellers, namely, the direction of the current of a river, the facts at present before us appear not only not contradictory, but even lend considerable probability to the theory that the Nyassa is connected with the Tanganyika, and that the Shiré may be the outlet of both of them, and also to the surplus waters of the Shirwa.

First, as to the elevation above the sea of the water-levels of these lakes. Speke places the Tanganyika at 1844 feet above the sea. Livingstone places the Shirwa at 2000. He has not yet given us the altitude of the Nyassa, but he reports that its waters are described as being separated from those of the Shirwa by a mere spit of land, which assuredly would be flooded in *some* seasons (if the Shirwa had no kind of outlet), and a water-way worn between the two lakes if there were not a free intercommunication between them through a porous soil, if by no more direct channel. In this way the surplus waters of the Shirwa might find an ultimate outlet by the Shiré.

Next, as to the recorded depression of 166 feet of the Tanganyika below the Shirwa or the Nyassa. This quantity is far too minute to be relied on as accurate, considering the nature of the observations employed by the two travellers, which were simply the record of the temperatures of boiling water, corrected for the temperature of the air. This simple and excellent method of determining heights approximately is wholly unreliable in a case like this unless special precautions be taken, and certain comparisons be made which have not been made in the present instances. For example, the thermometers require to be verified at the close of a journey as well as at its commencement, because their index errors are found to vary continually by a slight but accumulative change. Speke's thermometer had varied 1° Fahr. from first to last, which represents an altitude of 535 feet. Again, the variation of barometric pressure, though small between the tropics at sea, is even there sufficient to cause an error of 100 feet in any one observation, or a differential error of 200 feet between two observations, supposing the variation to have acted in opposite directions; and the

variation is greater on shore than at sea. There are other distracting causes, well known to observers, which I need not dwell upon here, having already said enough to show that we cannot rely for a moment on the recorded differential altitude of 166 feet between the two lakes. All that we are justified in saying at the present moment is that the three lakes, Tanganyika, Nyassa, and Shirwa, appear to be of about the same level, and that it is quite possible the Tanganyika may be the highest of them all. If it be so, and if the Tanganyika be connected (it may or may not be through a chain of small lakes) with the Nyassa, we should have an immediate solution of all our difficulties. The surplus waters would be accounted for, and the non-variation of the height of the Shiré river would also be accounted for, because the rains, as they followed the course of the sun, would never entirely leave the lake district during any part of the year. It is a district that would extend with more or less intermission in a long meridional strip of no less than 13° of latitude, beginning with lat. s. 16° , and ending with lat. s. 3° .

Far be it from me to press forward this solution in an undue manner. African geographers have too much cause to distrust geographical speculations; but I wish clearly to point out both the magnitude of the hydrological difficulties which embarrass us, and also the wide limits within which our speculations are obliged, for the present, to rove, in the absence of a few fundamental facts.

Captain Speke has again set sail for Africa. He has started, accompanied by our associate Captain Grant, under fair auspices again, and bound for the discovery of the sources of the Nile. This Society has abundant reason to acknowledge the liberal spirit in which Her Majesty's Government has acted in supporting this expedition. Captain Speke's instructions are to make the best of his way to the point whence he before turned back, at the southern end of the lake Nyanza, and thence to explore to its northern extremity, seeing whether or no it has a northern outlet. If there should be no connection between the Nyanza and the Nile, he is to use the best of his judgment in prosecuting his search to the sources of the latter, and finally he is to endeavour to reach Gondokoro, the missionary settlement formerly occupied by Knoblecher, and stated to be in N. lat. $4^{\circ} 25'$.

We are rejoiced to say that Captain Speke is not the only traveller on the Zanzibar coast. Dr. A. Roscher, a native of Hamburg, proceeded to Zanzibar in 1858, and in 1859 travelled along the coast as far as Kilwa, and explored the lower course of the Lufiji. In a

letter dated Zanzibar, November 21, 1859, he is said to have been met half way to the Nyassa. A Hanoverian gentleman, the Baron von Decken, who is known as a keen Algerian sportsman, and who is by no means unversed in the manipulation of geographical instruments, has already set sail for Zanzibar with a view towards a lengthened wandering among the Kilimandjaro range.

Consul Petherick's daring overland expedition to the southward of the Bahr el Ghazal is a successful feat that has taken all African geographers by surprise. The weapons and utensils that he has brought back from the interior are exceedingly curious; among them we find iron boomerangs, with sharp cutting edges, a most fearful instrument in savage warfare. The Bari people, who use them, are the only others in the world besides the Australians who appear to have discovered the singular properties of that strange projectile. The interest of Mr. Petherick's journey is very great, for he introduces us to an entirely new race of negroes, and its value will be largely increased when either his own astronomical observations, on a future occasion, or those of Captain Speke, shall have localized with certainty the scene of his late exploits. We have, farther, to acknowledge Mr. Petherick's valuable advice and offers of assistance in regard to Captain Speke's relief, should that officer reach Gondokoro.

From our enterprising associate, Mr. Cyril Graham, we learn that, wishing to go to Thebes, and not desiring to accompany the travellers passing up the Nile, he went to Suez, and embarked on board a vessel, with 300 Hagijis, bound for Mecca. They ran along the western shores of the Red Sea, until they reached "Cosseir," in lat. 26° N., where he landed, and proceeded towards Thebes. After four and a-half days' camel travelling, he reached Thebes, and passed through a country peopled by blacks, called Ababech. There was no water between this place and the Nile; a spring is found two days south of Cosseir, which supplies that place. The country crossed abounds in valuable mineral productions, as green and red porphyry, much prized by the Egyptians 5,000 years ago. To the south of this are gold and silver mines, although much exhausted. Mr. Graham remained 15 days at Thebes, and then started for the desert, and, travelling northward, reached Cairo in safety, after making the circuit in 37 days, over nearly 1,000 miles. Mr. Graham says that this journey had never been made before, and that he was repaid by the discovery of several interesting inscriptions. Here Mr. Graham remained a few days to translate a valuable Arabic MS., and then intended leaving for Syria to spend

the summer, and then re-visit the Haurán, hoping to penetrate into Arabia.

Our eminent explorer, Dr. Livingstone, has added largely to his former laurels by his explorations of the Shiré and Shirwa. I need not here recapitulate what has already appeared from time to time in the published "Proceedings" of this Society, and is, doubtless, familiar to all of us. His vessel, the *Ma Robert*, has, for some time, failed to satisfy his needs; and he awaits, in company with the remainder of his party, a new steamer, promised by the Admiralty, and now being constructed.* Mr. R. Thornton, the geologist, has quitted the party, and is at the present time conducting an expedition on his own behalf, of which some few scanty tidings have reached us.

Although much zeal is being shown by the Portuguese, in collecting and publishing the ancient and modern travels of their compatriots in Africa, it is remarkable that the numerous travellers of whom we have more or less information, should have contributed to so small an extent as they have done to a knowledge of the geography of South Central Africa.

This fact shows, in unmistakeable colours, the wide difference between a mere transit from one point to another, and that of a scientific exploration of a line of route. Unless the day-book be accurately kept, and astronomical observations be made from time to time, the narrative of a traveller is almost sure to become a chaos to the student. This has been the case with Portuguese discoverers generally, with the sole exception of Lacerda, who died in Central Africa more than half a century ago. The journey of Silva Porto, which was read some months since before this Society, and which will appear at length in its next Journal, is perhaps the most instructive of the mere narratives. It will be recollected that he was selected by the Governor of Angola as the most proper person to accept the proffered safe conduct of those Arabs who had previously crossed the continent from the eastward, and were about to return; and that he did return with them to Mozambique, and passed Livingstone, as that explorer issued for the first time from the interior; and that he had crossed Africa and reached the Eastern coast about the same time that Livingstone first emerged at the western. Silva Porto's journey, running as it does roughly parallel

* The *Pioneer* has just started, under the command of our associate, Mr. D. May, B.N.

to that of Livingstone, and to the northward of it, affords not a few points for comparison and verification, which have been ably discussed by Mr. J. Macqueen, and illustrated by a map which will be published at the same time with his paper. Perhaps at some future date the zeal of African geographers will give us, in a condensed form, the tangible results of Portuguese discovery from the earliest times—a subject of much historical interest, and not without present geographical importance. For the present we depend, in matters of South Central African geography, almost wholly upon what we have learnt from Livingstone, Lacerda, Burton, and Speke. For a knowledge of the exports, and imports, and commercial capabilities of the Mozambique coast of Africa, we are largely indebted to the various data collected by Mr. McLeod, late H.B.M. Consul of that place.

On the western coast of Africa, Mr. Andersson's arduous attempts at traversing an exceedingly wooded country, along a line untravellered by caravans and requiring the constant use of the axe for a distance of some 300 miles, ended in that explorer reaching what appears to be the southernmost branch of the head-waters of the Zambesi. His progress was checked by a severe fever that had prostrated him and most of his party for a space of four months. His discovery makes it improbable that the course of the Cunene should be so long, and, consequently, that its volume of water should be so great, as native reports to the south of that river had represented it. It is easy to conceive that men living in an otherwise arid land should have their imagination deeply impressed with a perennially flowing river, and that an exaggerated reputation of its size should have penetrated to the dwellers in the bush and Karoo. The times are indeed changed from those in which, some few years ago, the Orange River of the colony was the northernmost running water of which English travellers had certain knowledge, excepting only a portion of the then far-famed Limpopo. Now, the Karri-harri Desert has been crossed by many tracks; the lake Ngami, which then was usually considered a myth, has been long since searched out and overpassed; and the great length of the mighty Zambesi is familiarly known.

Through our honoured Associate, Sir William Hooker, we have received some very good memoranda of a Trading Trip into the Orange River Sovereignty, and the country of the Transvaal Boers, in 1851-2, by Mr. J. Sanderson, which will be published in our Journal, with a map by Arrowsmith.

Farther to the north I have to direct your attention to a remarkable exploration by Du Chaillu, an American naturalist, of French descent, sent out by the Academy of Philadelphia. I speak of his discoveries in the equatorial regions of West Africa. That traveller, during a period of four years, spent in wanderings in pursuit of natural history, which has resulted in a very valuable collection, discovered that what had been hitherto considered as two distinct rivers, namely, the Nazareth and Mexias, running into the sea at lats. s. $0^{\circ} 41'$ and $0^{\circ} 56'$ respectively, are, in fact, the delta forming mouths of a single important stream, which also inosculates and in part discharges itself through the Fernando Vaz or Camma. His travels extended to a very considerable distance in an easterly direction. He found the main stream, called the Ogobai, to be formed by two enormous tributaries, the Rembo Apingi to the south and the Rembo Okandu to the north. He reached the former of these at an estimated distance of 350 miles of travel from the western coast, and found it a noble stream, 500 yards broad, from 3 to 4 fathoms deep, and running with great force.

Dr. Barth suspects the Ogobai to be the lower part of that river which he made out from information as running westward many days' journey south from Wadai, and he believes there is a vast field for future discovery along the northern branch of that river, viz. the Rembo Okandu. Du Chaillu has thus opened access to that great drainage of which Bowditch had already collected so much information, and we have now unexpectedly found an immense river—a rival, perhaps, in length and importance to either the Congo or the Zambesi, apparently more accessible to Europeans than either of them, and running into the sea at the very *waist* of Africa (if such an expression be permitted), the very place whence the central part of the equatorial regions of that continent may be reached at the least distance from the coast.

The results obtained during the last year by Dr. Baikie are not yet in our hands, neither does a decision appear to have been yet arrived at concerning the future destination of this expedition. Lieutenant Glover, R.N., has arrived in England from the Niger, and is preparing his surveys for the Admiralty.

A report has been circulated referring to a contemplated expedition of the French by two military detachments, the one from Senegal, and the other from Algeria, to converge upon Timbuctu. In the mean time the district even immediately adjacent to Algeria is so far inaccessible to the French that the recent journey of

Duveyrier to El Golea has justly earned the character of a daring adventure, and the often-repeated offer of a prize has induced no French traveller to hazard the dangerous route that is proposed to be followed by large caravans.

An Arab, M. Ismael Bonderba, educated in France and attached as interpreter to the "Bureau Arabe," has published an interesting account in the 'Revue Algérienne' of his excursion from Algeria to Ghât. To the south of Wargla he traversed the region of sand and sand-hills termed El Edj, extending on one hand to the south of Golea, and on the other to Ghadamis. This enterprising gentleman had already before this made a journey from Hed Suf to Ghadamis in 1857. According to M. Bonderba's barometrical observations, Mr. Ravenstein informs me that the elevation of Laghnat is 2340 feet above the sea; that the land falls thence to the oasis of Wargla, and at Negussa the elevation is only 120 feet. From Wargla to Ghât the land rises again, and it appears that the drainage of this part, as far as the Jebel Noggur, is towards the Sahara of Algeria, enabling the French to obtain a large supply of water by means of artesian wells. The altitude of Ghât is 1830 feet, or considerably more than has been assigned to it by Overweg.

Some interest and probably no small degree of future importance is connected with the geographical researches which have, within the past year, been made by enterprising persons of African race.

Information has been received from the remarkable African republic of Liberia that the Messrs. Amos have returned from a tour of observation to the Falls of the Sinoa River, which place they recommend as the site of a future mission. Mr. Miller had just reached Monrovia from a tour to the Golah country, where also a mission is contemplated.

A much more considerable exploring expedition has been sent out by the Liberians. It occupied at least six months, and appears to have been ably performed by the Liberian travellers, Seymour and Ash. Though making no pretensions to scientific acquirements, they have furnished a very interesting narrative which is continued through many numbers of the 'Liberia Herald.'

They reached the city of Quanga, situated in a mountainous region, a part of the Kong Mountains. Quanga is a large walled town, 2500 paces in circumference, having five gates, from which there are roads leading to other cities and towns. They state this city to be 287 miles from Monrovia, 384 from Grand Bassa, and

14 days' march from Sierra Leone. Sierra-Leone English is understood by some of the people.

In the course of their journey they visited several other large and populous towns, having well-constructed mud walls 12 feet high and 4 thick. The scenery is described as very diversified, and in some places charmingly beautiful. The population of the country is remarkably industrious; not merely having very extensive tracts under cultivation and raising a great variety of crops, including rice and corn, but exercised in many kinds of manufacture, weaving thousands of yards of cotton cloth, and working in iron and other metals. In some places the people may be considered wealthy. The women in one of the towns are described as beautiful; their clothing white cotton cloth, and their ornaments so rich that 30 dollars' worth of gold might be worn by one person. The quantity of silver was beyond the travellers' attempts at estimation.

Cattle, sheep, and goats appear to abound, and some of the cattle are very fine. Horses, which are said not to live in Liberia, were seen near the city of Quanga, and are valued at from 40 to 60 dollars.

It would not be doing justice to these African travellers to omit stating that they collected specimens and statistical information, noticed the natural history and geology of the country, made some ethnological and medical observations, and enquired into the religion of the inhabitants. Mahomedanism has been introduced by the Mandingoes, to whom these people are allied, but it seems to have a slight hold upon them. It is believed they would readily receive Christian instruction.

It was very evident that important commercial relations might be formed with the people whom these travellers visited. They received the strangers with almost universal kindness and interest; and the only serious difficulty which occurred, and which was nearly being fatal to both travellers, arose from their own imprudence in not sufficiently attending to the advice and direction of one of the head men.

A letter from Alexander Crummell, an American of African descent who received a part of his education at Cambridge, has been forwarded to Sir R. Murchison. It was dated from Cape Palmas, towards the southern extremity of Liberia, and gives some particulars of a journey up the Cavalla River to the distance of about 85 miles, near which point the navigation of this fine river

is interrupted by a fall and dangerous rapids. Other falls are said to exist 15 miles higher up the river.

The most remarkable, and as to its results that which is likely to prove the most important of the late explorations of coloured travellers, is that from which Dr. Delany and his companion Mr. Robert Campbell are just returned. They both proceeded from the United States; the former going direct to Africa, the latter coming to England, where, through the generous kindness of our members, Dr. Hodgkin, Henry Christy, and other gentlemen, he was provided with his outfit and free passage to the coast of Africa.

The travellers met at Lagos; and, by a journey full of interesting incident and productive of much valuable information, and giving them frequent important and promising intercourse with the natives and their chiefs, they reached the city of Alorie, situated about 400 miles from the coast, and in the route from the coast to the upper waters of the Niger; a course which, while the difficulties of navigating that river remain to be overcome, affords the most promising outlet for the productions of this part of Africa.

It should be stated that these travellers undertook their interesting tour on behalf of an Association of coloured Americans, who are anxious to find in the land of their forefathers a refuge from the slavery which weighs them down in America; and they hope, with justifiable ambition, to become the means of elevating the natives of Africa, while finding a fit scope for their own unrestrained energies and talents. The travellers have well performed their mission, and appear to have found an open door. They will doubtless soon give to the public, as well as to those who delegated them, the fruits of their researches.

We have already learnt from them that they found large and populous towns of industrious people. The cultivation of the ground is so extensively carried on that in one district they rode for seven hours through a continued succession of corn-fields, interrupted only by paths and a few bushes. Looms were extremely numerous, and considerable variety of manufacture was carried on. The horses in use among the people were some of them remarkably good, resembling the Arab breed. It will be remembered that our own able African traveller, E. Bowditch, when he visited the Ashantees, found at Cromane a solitary horse which the people had not learnt to use, and that he broke the animal for the king.

Dr. Delany and Mr. Campbell experienced great advantages in their African descent and appearance, and were received as

Europeans could not have been. They obtained by formal treaty, in which they were assisted by the well-known native African episcopal clergymen, Mr. Crowther and his son, the facilities and promise of toleration and protection which they sought for their constituents; and it must be added that this successful tour of nine months' duration on the continent of Africa cost them less than 100*l.*, which forms a striking contrast with our expensive expeditions.

ASIA.

Syria.—From our excellent associate, Sir Woodbine Parish, we have received the account of Sir Eyre Coote's journey from Bussora to Aleppo, which has been strongly recommended to be printed in our Journal, by no less an authority on this subject than our associate, Mr. Cyril Graham.

From Dr. J. Wortabet, M.D., we have also received an original MS. on the Hermon, and the physical features of Syria and Palestine.

Persia.—Our associate, Captain Claude Clark, has furnished us with a valuable paper on routes from Tehr  n to Her  t, then to Shahraad, and Tehr  n to Bushir.


Caucasus.—Baron de Bode, the well known traveller, has given us a lively sketch of Hilly Daghest  n, and the Lesghi tribes of the eastern chain of the Caucasus.

Kuria Muria.—A lively account of the Kuria Muria islands, by Dr. Buist, has been published in our Proceedings.

Hindustan.—In the past year we have had only two papers on the subject of the greatest of our dependencies, but these have been on a highly interesting portion of them—the mountain valley of Kashmir, the country of the Shawl, and the celebrated retreat of the Mogul sovereigns of Delhi from the sultry heats of the summers of the plain. These communications were in illustration of a beautiful MS. map of the Trigonometrical Survey of Kashmir, submitted to the Council by the India Office, and exhibited at one of our meetings. It represents the physical features of the country, and has been constructed, with great labour and care, under the direction of our medallist Colonel A. S. Waugh, by our associate, Captain Montgomerie of the Bengal Engineers, and is now being lithographed by Mr. J. Walker, Hydrographer to the Hon. E. I. Company, and will shortly be published. Here, at an average height of 6500 feet above the sea-level, we have a population, by race Hindu, occupying a country which in physical geography, animal and veget

ducts, bears no small resemblance to Switzerland. The authors of these able contributions towards our better knowledge of Kashmir are two gentlemen connected with the celebrated Trigonometrical Survey of India, begun by Lambton, carried forward by Everest, and now about to be brought to a conclusion by Waugh, after sixty years' indefatigable and skilful labour. We can form to ourselves some notion of the difficulties encountered in the Himalayan portion of this vast undertaking, when I state that, out of the sixteen principal stations of the Survey, fourteen were 16,000 feet above the level of the sea, and two 18,000—that is, 3252 feet higher than Mont Blanc. Our best thanks are due to the authors of these papers, Captain H. Godwin Austen and Mr. William H. Purdon.

Before quitting the subject of Hindustan, I may bring under your notice the extent of our dominion in that region; and this I do on the authority of Colonel Waugh, the Surveyor-General of India. Our own territory amounts, in round numbers, to 800,000 square miles, and that of our tributaries to 500,000; the aggregate of these sums forming a country six-fold greater than Imperial France, and twelve times the extent of our own islands. You will allow me to congratulate you on the restoration of tranquillity to this vast empire, and the total suppression of an insurrection of unheard-of extent, in which deeds of constancy and valour have been exhibited by our countrymen, and, indeed, also by our countrywomen, which have elevated the national character. We have even already, and within three short years of the Sovereign's direct assumption of the government of our great dependency, evidence of advancing prosperity in the increase of commerce, the great bond which unites peoples to each other. Exclusive of a large trade with other nations, we ourselves received from India, in the last year to which the returns have been completed (1858), merchandise, many articles of which were unknown to our forefathers, to the value of from fifteen to sixteen millions (15,742,528*l.*), an increase in five years' time of above four millions (4,308,117*l.*). Exclusive of eleven millions' worth of gold and silver, we sent the people of India merchandise in the same year to above eighteen millions' worth (18,387,588*l.*), being an increase in five years of near eight millions (7,948,487*l.*), or of 76 per cent. The greater part of our exports consisted of British manufactures of which, half a century ago, it was supposed the Hindus were incapable of becoming consumers.



Eleven sheets of the Great Trigonometrical Survey of India have this year been added to the Atlas, making 61 sheets published, and several more are in the hands of the engraver.

The Hindu-Chinese Countries.—From the vast region which geographers have frequently designated by this name, and which embraces 16 degrees of longitude and 13 of latitude, all intertropical, our Society has had within the year three papers. The scanty inhabitants of this great region, as yet so imperfectly known to us, may be very briefly sketched. The race of man, a peculiar one, would seem to be one and the same throughout, but it is found in two very different states of social existence. The most advanced possesses an ancient civilisation, and the most considerable nations of them are the Arracanese, the Burmese, the Peguans, the Shans or Laos, the Siamese, the Cambodians, and the Anamites or people of Cochin-China and Tonquin. But scattered among these are a rude people, composed of many distinct tribes speaking for the most part distinct languages, without knowledge of letters, and with but slender knowledge of agriculture and the common arts of life.

It is of the last of these people, under the designation of Karen, which seems a general term of the Burmese language for a rude or uncivilised people, that we have an account of some tribes inhabiting the countries ceded to us by the Burmese, in the elaborate Diary of Mr. Edward O'Reilly, a functionary of our government in Pegu, and a gentleman well skilled in the Burmese language. The more civilised nations above enumerated have systematic forms of religion, generally that of Buddha, received from India; while the rude tribes have only loose superstitions. It is among the latter that the propagation of Christianity has been successful to a degree, indeed, unknown in any part of India, it being computed that not fewer than 40,000 of them have been converted within the last thirty years. The credit of these conversions is due to the American mission in Burmah, the founder and leader of which was the late excellent, amiable, and prudent and judicious, though zealous Dr. Judson.

The second paper on the Hindu-Chinese countries is by a Fellow of our Society, our Consul in Siam, Sir Robert Schomburgk. This describes a journey which the Consul himself made from the Siamese capital, Bangkok, to a town on the western coast of the Gulf of Siam called Pecha-buri, never before described. Sir Robert Schomburgk has, I believe, suggested the feasibility of a ship-canal, or at all events of a railway across the Isthmus of Kra, which would

connect the Gulfs of Bengal and Siam, and so save the longer passage to China through the Straits of Malacca; but as no details of this scheme have yet been laid before the Society, it will be sufficient to indicate the existence of the project.

I may here briefly refer to the extraordinary progress which the foreign commerce of Siam, but more especially our own trade with it, has made in recent years. Forty years ago there was hardly any European trade with this kingdom; and I find that in 1856 the number of European vessels that entered and cleared out from Bangkok amounted to fifty, importing cargoes to the value of near 400,000*l*. This has been chiefly owing to the remarkable man who at present rules this remote country—a man who speaks and writes our own language, who has introduced the printing-press, and who possesses a considerable steam fleet. I may, indeed, describe him as a kind of Asiatic “Peter the Great” on a small scale.

Our third paper on the Hindu-Chinese countries is in the form of a letter from a French naturalist, M. Mouhot, and relates to the little-known country of Cambodia, or, more correctly, Kamboja—a poor kingdom, reduced to very slender dimensions by the usurpations of the Siamese to the north and of the Cochin-Chinese to the south. M. Mouhot's letter is dated in October last, and from the station of a Catholic French Mission called Bréhem, in the country of a rude race called the Stien, “*Chez les sauvages Stien*,” in lat. $11^{\circ} 46' 30''$, and long. $103^{\circ} 3'$. M. Mouhot had crossed the Mekong or Great River of Cambodia on his route to the missionary station in question, and describes it as not less than three miles broad, and containing many large islands. At no great distance above where he crossed this great stream, he describes it as obstructed by falls, so that it is not navigable for probably above 200 miles from the sea.

A full and very interesting account of Cambodia will be found in the volume of our Journal now printing, compiled by our associate Mr. James Campbell, Surgeon in the Royal Navy, from the papers of the late Mr. Forrest and of the Rev. Dr. Housc. To ourselves and to other European nations Cambodia is at present an object of considerable interest, for within it the French have lately formed an establishment which is likely to be a permanent one. This consists of the town of Saigon, on a river of the same name, and situated about 50 miles from the sea. The river for navigation is probably the finest of Asia west of the Yang-tse-kiang, the country an alluvial one of eminent fertility, and the position as against any Asiatic enemy an impregnable one. The

neighbouring country is very thinly inhabited; but, by a liberal introduction of Chinese emigrants, and sound commercial regulations, Saigon may become a valuable emporium and a convenient harbour of refuge to ships damaged by the storms of the China Sea.

China.—In the course of the past year we have had but two communications to add to the large stock supplied to us in the previous one by such eminent contributors as our Associates Sir John Davis, Captain Sherard Osborn, Mr. Laurence Oliphant, and Dr. Macgowan of the U.S. The first of these papers, which we owe to the kindness of one of our Fellows, Mr. Hugh Lindsay, is the diary of Mr. Mickie, kept by him in a voyage from Shanghai to the Gulfs of Pecheli and Laotung. In the course of his paper, this accurate and very intelligent traveller furnishes us with new and valuable information on the hydrography, topography, and climate of the countries he saw. One fact he brings to our knowledge, of which we were but partially informed before, that, through the distracted state of China and the consequent extent of piracy on its coasts, the carrying and coasting trade of the country is in a good measure carried on in European shipping instead of Chinese junks.

The second communication is contained in a letter to Dr. Shaw from Lieutenant Lindesay Brine, R.N., and gives a very instructive account of the Si-kiang or West River, which has been usually called by us the Broadway, and sometimes the Blue River. This stream, hitherto unvisited by Europeans, was found by the expedition under Captain M'Cleverty, R.N., which ascended it in February of last year, to be a broad navigable river to the length of 75 miles.

Respecting the vast empire which has now become so important to us, I shall only state a few broad facts which appear to me of great interest, not only to the geographer but to the statesman. It is well known that a census of the population of China was taken in 1812, which made it in round numbers amount to 360,000,000. Another has recently been taken which raised this large sum to 412,000,000, showing that during forty-eight years the inhabitants of China had increased by 52,000,000—or little short of double our own numbers at the census taken ten years ago. Always closely pressed for the means of subsistence, the people of China are of course at present more so than at any previously known period of their history, and hence the emigration which is going on beyond all precedent with this home-loving people to such remote countries as Australia, California

Antilles. Her Majesty Queen Victoria has at present in Hong-kong, in her Malayan colonies, and in Australia, not fewer than a quarter of a million of Chinese subjects, among whom are to be found wealthy merchants and large ship-owners.

This singular people, more numerous than all the other people of Asia put together, and in a far larger proportion more ingenious and laborious than the most civilised of them, is so addicted to a commercial intercourse with strangers that they may be truly said to carry it on in despite of their own government—ever, from fear, adverse to foreign intercourse of whatever description. Just now we are at war with China, yet our trade with it goes on as if we were at peace, and such has been the case in all former periods of hostility.

It will be instructive to mention a few prominent facts connected with our commercial intercourse with China. Thirty years ago, our importation of tea, a necessary of life to the whole Anglo-Saxon race, did not exceed 30,000,000 lbs. In 1858, the last year to which the public returns have been made up, it had risen to 75,432,535, of the value of 5,206,618*l.*, and yielding a revenue of 5,186,170*l.* The raw silk with which the Chinese supplied us thirty years ago was a trifle hardly worth recording. On the average of the last three years it was of the value of 4,284,472*l.* In the two articles of cotton and opium, the Chinese take not less than 18,000,000*l.* of our Indian produce, the last of these articles yielding a revenue to the Indian Treasury little short of that which tea yields to the English, with this material advantage, that it is not our own subjects but the Chinese who pay the tax.

The Chinese do not take our own productions and manufactures to the extent that might be expected from so numerous and industrious a people, still our exports to China are on the increase, for in 1858 they had risen to 4,119,573*l.*, exclusive of 6,000,000*l.* of silver, which we were enabled to send by exchanging it for our manufactures and for the gold of Australia, whereas four years before they were no more than 1,505,409*l.*, which shows, even in this short period, an advance of no less than 173 per cent. Altogether, it is computed that no less than 50,000,000*l.* of British capital are engaged in the trade of China.*

We have also received from our associate, Major W. S. Sherwill, Deputy-Surveyor-General of India, a map of the China coast, from

* For other notices on China see Admiralty Surveys.

the Canton River to the Gulf of Pecheli, with a rough outline of the provinces between Canton and Pekin. Several valuable remarks and statistical tables are engraved on the map, which is published on a scale of 24 miles to an inch, at Calcutta, Nov., 1859.

The Indian and Philippine Archipelagos.—On the subject of the great Indian and Philippine Archipelagos we have received in the past year no communications; but two of our Fellows, Lieutenant De Crespigny, of the Royal Navy, and the eminent naturalist Mr. A. R. Wallace, former contributors of valuable information, are still on this promising field, in which Dutch geographers have in recent years reaped a rich harvest of knowledge. To show that this considerable portion of the globe is of much moment, it will be sufficient that I state a few facts which have been tolerably well ascertained respecting it. The number of its islands and islets has been computed at 6000, the thirty largest of which are computed to have an area of 700,000 square miles, or seven times the extent of Great Britain and Ireland. The Dutch possessions, including tributary States, have been computed to have a population of 17,000,000, the Spanish of 5,000,000, and our own of 250,000, or one-twentieth part of the last of these. But the external commerce of the three nations is in a very different ratio to that of their populations, for our own joint export and import trade last year was 16,430,152*l.*, the Dutch 14,747,414*l.*, and the Spanish but 2,160,000*l.*

Japan.—On the subject of this empire, with its computed 30,000,000 of inhabitants, and its considerable but very eccentric civilisation, its climate, sometimes partaking of our own, sometimes of that of the most southern parts of Europe, and sometimes approaching that of Kamschatka, we have in the past year no contributions towards our knowledge. Practically, indeed, we know nothing of this great country beyond having seen a very few of its towns, and a small extent of its highways. Not a man among us has acquired its language; and, in a word, it may safely be asserted that there is no part of the world of equal importance so little known to civilised Europe. It is earnestly to be hoped that a better understanding with the Japanese, than at present exists, will extend the bounds of our knowledge of them and their country.

AUSTRALIA.

The communications made to the Society on the subject of this continent (we have long and justly ceased to call it a mere island) have been most important. They in fact embrace great

practical discoveries of new and available territory. In the prosecution of these discoveries, what Mr. Burke calls "the dexterous and firm sagacity of English enterprise" has never been more eminently displayed. Among the most eager of Australian discoverers must be ranked His Excellency Sir Richard Macdonnell, the Governor of South Australia, who in his own person gives a signal example of the precepts he lays down for the conduct of the subordinate officers of his government. We are indebted to the courtesy and geographical zeal of the Secretary for the Colonies for Sir Richard's public despatches, and from these, and an interesting private letter of his own addressed to my predecessor, we have an account of one of his journeys. In the course of this expedition, which extended over seventy-seven days, he rode 1800 miles, penetrating the continent to the 28° of latitude, bivouacking at night, and seeking shelter in the day from a heat sometimes reaching 115° of the thermometer, under the scanty shade of a few branches of the scrub.

Under the auspices of Sir Richard Macdonnell, Mr. William Randell performed last year the most remarkable achievement in steam navigation which has yet been accomplished on the Australian continent. This consisted in a voyage on the Darling, extending by the windings of the river to 2400 miles from the sea, and to 1800 reckoning from the junction of the Darling and Murray. The Darling in its long course has but a single fall of about 8 feet in several hundred yards, an obstruction to its navigation only when its waters are at the lowest; so that we have here a great water way into the interior of the continent, and already on the fertile banks of the Darling many runs have been established.

Mr. Macdougall Stuart, whose discovery of a well watered country in Southern Australia, equal in area to half that of Ireland, was brought to our knowledge last year, is, by the most recent accounts, prosecuting new discoveries with the hardy intrepidity which characterised his previous one, and which called for the marked approbation of our Society, and the substantial reward of the local Government.*

The coasting charts, twelve in number, on various scales, published by the Trinity House, Adelaide, under the superintendence of B. Douglas, Esq., and accompanied by sailing directions, will be duly appreciated by mariners visiting those parts of Australia.

* Through the Duke of Newcastle, H.M. Secretary for the Colonies, a gold watch was forwarded to Mr. Stuart from this Society.

On the north-eastern side of the continent, and towards the southern limits of the new government of Queensland, a very important discovery has been made, consisting of a capacious harbour sheltered from every wind. The territory within which this harbour exists is on the eastern slopes of the Australian Alps, and is therefore probably well watered, which is equivalent to its being fertile, since it lies close to the Tropic. Should this turn out to be the case, it will most likely be found well adapted to the growth of cotton, the sugar cane, and even coffee. In this event an abundance of suitable labour only will be wanting, which can be supplied by a liberal importation of Chinese immigrants. By favour of the Duke of Newcastle, the despatch of His Excellency Sir George F. Bowen, F.R.G.S., describing the new harbour, has been furnished to us.

The map of the colony of Queensland, by Mr. L. F. Landsberg, extending from the parallel of 22° S. to 28° S., and to about 5° from the coast, exhibits considerable detail.

The map of Tasmania, in four sheets—scale $\frac{1}{316800}$, or about 5 miles to an inch, by James Sprent, Esq., Surveyor-General—is coloured to distinguish the counties, gives soundings, and is apparently the largest and best map published.

This sketch of Australian discoveries in the course of the past year would be imperfect if I were to pass unnoticed the perspicuous and popular explanation which, at two meetings of the Society, was given of this continent by Professor Jukes, derived from his own personal experience and long meditation. He clearly pointed out the source of that general character of drought which we know, from our seventy years' experience of it, belongs to the Australian land, and he indicated the causes which in particular localities tended to mitigate it. From the Professor's account we shall probably be led to the conclusion that the common belief that the great mass of the interior of the continent is but an arid desert, is well founded.

But even allowing such to be the case, still a vast amount of land remains for human use, and by good fortune it has so happened that we have hit at once on the best parts of the country. To judge by our experience of it, Australia may, as it appears to me, be described as a country of great drought, but at the same time, and probably arising from this very drought, a country of eminent salubrity, far exceeding in this respect every other colony founded by the nations of Europe. Not only does the European thrive in

a country not made for him, but to judge by the experience of three generations, he continues to thrive without the smallest appearance of degeneracy.

Besides this it may be said, that not only does the European thrive in the soil and climate of Australia, but all the animals which he had domesticated in Europe equally do so. For one of these animals, the sheep, Australia is better fitted than any other colony ever founded by the European race, and this country, with the exception of its intertropical portion, may be designated as an eminently pastoral one. For strictly agricultural purposes it is obviously less suited, for while it exports wool it imports corn.

The mineral wealth of Australia is remarkable, although as yet its development has but commenced. Independent of its iron and coal, it produces gold, silver, copper, tin, and lead ores, which are extensively imported into England.

Under the shield of the parent country, and in the enjoyment of the liberty which we ourselves possess, the Australian Colonies have made a progress of which there is hardly an example. Five small colonies, which ten years ago had between them a population not exceeding 400,000, contain now more than a million of people. They furnish us every year, and have been doing so for the last seven years, with 10,000,000*l.* worth of gold, with above 10,000 tons of copper, tin, and lead ore, and to the value of near four millions and a half of wool and tallow, while of British merchandise they consume above eleven millions and a half's worth, or at the average rate of 11*l.* 10*s.* for every colonist,—incontestable evidence of their value to us, as well as of their own prosperity.

EUROPE.

Russia.—After mentioning the labours of our own countrymen in various directions, I could scarcely speak of any more interesting than those of Russia. Her fields of research are so vast as to be almost inexhaustible; and year by year she solves the mysteries of some remote *terra incognita*, and accelerates the progress of geographical science. A successful war places at her disposal the treasures of the Caucasus, while, under the auspices of peace, her merchants and men of science carry the influence and civilization of their country to the confines of China and the base of the Himálayas, across a region of historic and scientific interest.

To the recent researches of Russian geographers we are indebted

for our present knowledge of one of the finest rivers of the world—the Amúr, which M.M. Peschurof, Permikin, Raddé, and other pioneers have so minutely described. Their narratives, translated for us by Mr. T. Michell, appear in an English garb in our Transactions for 1859, accompanied by an excellent map by Mr. Arrowsmith. With these, our knowledge of the Amúr is pretty complete; but much interesting matter will yet be furnished by the exploration still pursued, and by translations from other Russian accounts. Mr. Maak's work on the Amúr, alluded to by my predecessor in this chair at our last annual meeting, has been published at St. Petersburg, together with a map by M. Samokhvalof.

But I would more particularly draw your attention to Central Asia, as a country of permanent interest to every lover of geographical science. Since the days of Czomo de Koroos, the celebrated Major, of our lamented Moorcroft and Trebeck, and of Wolf and Atkinson, much light has been thrown by Russian travellers on the Steppes of Turkestan.

The most recent scientific traveller in Central Asia is Captain Golubëf, of the Imperial Staff, who in 1859 explored the western part of the country between the Tian-shan and Alataú chains and the low valley of Lake Balkhash. That tract of country embraces the Semirechni (Seven Rivers) and Trans-ilian districts of the Russian Empire, and the provinces of Ili and Tarbagatai, appertaining to China; and while it is one of the regions of Central Asia least known to geographers, it is also one of the most interesting, forming, as it does, the boundary between the elevated plateaux of Asia and the Steppes, which extend from the Caspian to the lake of Balkhash.

The farthest point beyond the Russian frontier determined by Captain Golubëf, was the Buddhist Monastery of Sumbé, which no European traveller had yet visited. The hypsometrical observations made by this gentleman are of the highest value. He has, for instance, ascertained that the extensive lake of Issyk-kul, the most central point of Asia, situated between the Tian-Shan and Trans-ilian Alataú ranges, has an absolute elevation of about 5000 feet; while Fort Vernoó, a modern Russian fortification, about 55 miles to the northward, lies 2700 feet below the level of the lake.

A memoir on the Russian trade with Central Asia was read at the last meeting of the British Association for the Advancement of Science by our associate, Mr. Michell, whose intimacy with the Russian language has enabled him to consult the most recent

and authentic data in connection with the subject. He introduced to our notice a valuable work on Central Asia by M. P. Nebolsin, a Fellow of the Imperial Geographical Society of Russia, from which Mr. Michell has drawn many particulars relative to the social condition and requirements of the country east of the Caspian. It appears that between 1849 and 1857, the exports of Russia to Bukhára, Khiva, and Kokán had increased 78 per cent., and the imports from those countries 104 per cent.

The Khorassan Expedition, under M. Khanikof, has returned to Russia with much valuable information. M. Lentz and other members of the expedition have communicated to the Imperial Geographical Society the outlines of their labours in Persia and Afghanistan, but the general result of their explorations has not yet been laid before the public.

As M. Khanikof is shortly to appear among us, I have no wish to anticipate the valuable report which he probably will furnish. I may, however, say generally, that his researches are supposed to have been of the greatest importance to science. With regard to geography, in particular, our maps of Persia are threatened with considerable alterations, the expedition having frequently proved their incorrectness. Many towns depicted on modern maps have no existence, and the town of Tebbès—to mention one instance out of many—will have to be removed a degree and a half to the westward and a degree to the southward. According to the 'Compte Rendu' for 1859, no less than 100 points were determined astronomically by the expedition, and its explorations embraced 10 degrees of longitude and 13 of latitude.

The inquiry into the practicability of establishing a navigable water-way between the Caspian and Azof Seas has been revived. This project is of great antiquity, having been contemplated by Sultan Selim II., about the year 1570, and subsequently by Peter the Great, who, in 1697, caused works to be commenced with the object of establishing a communication between the Volga and the Don. These were, however, discontinued in 1701, and to this day the Don is the only great river in Russia unconnected with any other. Explorations were also made in 1831 and 1846 to ascertain the practicability of effecting the desired junction by means of the Kurá, but they appear to have revealed insurmountable obstacles.

Dr. Bergsträsser, of St. Petersburg, is now engaged in inquiring into the possibility of uniting the Caspian and Azof, by improving the water-way which now partially connects those seas. A very

extensive depression or valley, supposed to have been formed by the disjunction of the Black and Caspian Seas on the upheaval of the Caucasian chain, runs along the isthmus between the Azof and Caspian. Two distinct streams, severally called the Eastern and Western Manych, occur in this valley. Their water-parting is formed by the anticlinal axis of the country, at about 170 miles west of the Caspian, and which rises to an elevation of 107 feet above the Caspian and 23 feet above the Euxine.

The river Kaláns, coming down from the lower range of the Caucasus, disembogues a little to the west of this watershed into the Manych valley, and its waters principally flow off to the Eastern Manych, causing a very rapid current.

In spring, the Eastern and Western Manych are united at their sources by a shallow lake, called Shara-Hulusun; but this lake is not even navigable by boats. It is at this spot that Dr. Bergsträsser suggests the construction of an immense reservoir or lock. The Eastern Manych flows on within 47 miles of the Caspian, occasionally spreading out in shallow inundations and lakes; and in spring and autumn its waters find their way to the Caspian, in conjunction with those of the Kumá.* It terminates in a lake which was once apparently connected with the Caspian, for a river-bed, in some parts filled with drifted sand, extends from it towards the sea, and the waters of the Caspian still ascend it for a certain distance on the prevalence of south-easterly winds. Dr. Bergsträsser considers that this river-bed might be cleared at a very small expense, and that, by removing the artificial obstructions by which a great portion of the Kumá and Manych waters is now deflected towards the pasturages of wandering tribes, and by collecting those waters within a single bed of no very great breadth, a navigable stream will be easily produced, available for steamers and vessels of war.

Before I quit this subject, let me express the regret with which we have heard of Mr. Lamansky's resignation of office as Secretary of the Imperial Geographical Society of Russia. The science we pursue, owes much to the indefatigable exertions of that gentleman, and is especially indebted to him for much valuable assistance and co-operation. Mr. Theodore Thörner has been elected in his stead, and will doubtless prove a very worthy successor.

* The western Manych was navigated in 1859 by a boat-party from its water-parting to the Sea of Azof. An account of this voyage is given in a Memoir by Dr. Bergsträsser, who urges a further scientific survey of the Manych valley. See 'Morskoi Sbornik' for October, 1859.

Nor should I omit the geographical and statistical descriptions of Russia recently published in the new edition of the 'Encyclopædia Britannica.' I have the greater pleasure in drawing your attention to this article, since it is the production of our countryman—Professor Bishop of St. Petersburg.

Sweden and Norway.—The Expedition to the Polar Seas, proposed by the Swedish Government, has already been mentioned, but we have had to acknowledge with thanks the receipt of the useful maps and charts of Sweden and Norway, which continue to be regularly sent to us from those countries. Among the latest of these may be noticed the map of the province of Göthaborg in two sheets, scale about three miles to an inch, and executed in the same clear style as the previously published maps of the provinces of Carlskrona, Skaraborg, &c.

Denmark.—Captain Rhode, the Hydrographer of Denmark, has published an excellent chart of the north part of the Cattegat, of which the southern part will also soon appear.

The Royal Society of Northern Antiquaries of Denmark, under the able guidance of its Secretary, our learned Associate, Professor C. C. Rafn, continues the publications of its useful historical Annals and Memoirs.

From our Corresponding member, Captain C. Irminger, of the Royal Danish Navy, we learn with pleasure that Carl Petersen, the steady and trustworthy companion of Penny, Kane, Hayes, and McClintock, who had last year received from his Sovereign, the King of Denmark, the silver cross of Dannebrog, for his services in Greenland and the Arctic Regions, has since been gratified by the appointment of Inspector to the Light-house on the Island of "Hjelm" in the Cattegat, about 3 miles from the east coast of Jutland.

Germany.—A map of Frankfort, in 16 sheets, is engraved on the scale of $1\frac{1}{3}$ or about 4 feet to the mile, by A. Ravenstein, and deservedly ranks with any of the continental-city monographs.

Four elaborately tinted maps of the late Major A. Papen's Atlas of Central Europe, by A. Ravenstein, have been added to the five previously published, and the remaining three may be shortly expected.

Prussia.—Of the topographical map of Prussia, 10 sheets have been published this year, including portions of Thuringia. The Prussian Admiralty have published a chart of the estuaries of the Jade, Weser, and Elbe, in 6 sheets.

Austria.—A map of Dalmatia is near completion, as also one of Hungary and Galicia.

Turkey.—A map in 6 sheets, scale $\frac{1}{100,000}$, of Wallachia, is at present being engraved at the Military Geographical Institute of Vienna: it is a reduction of the survey made by the Austrian officers in 1856-7.

From Major J. Stokes, R.E., we have received an important paper, accompanied by a map, on which is marked with great precision the present state of the mouths of the Danube, with off-shore soundings. The writer compares this map with others of earlier date, and clearly shows how the various delta has been formed; how some passages have been silted up, and the deep-water channels opened out in other directions; that the débris of the soil, brought down the river at different periods from the interior, is first deposited on the coast, shoaling thus the water around the various mouths, until, by the accumulation of strata upon strata, it appears above water, through which the river forces its way, forming islands with tortuous channels, and the whole coast-line is gradually carried seaward.

Holland.—Six sheets have this year been added to the large map of Holland, on the scale $\frac{1}{100,000}$ or $1\frac{1}{10}$ inch to the mile, making 24 sheets published out of 62, of which the map will consist when complete.*

Belgium.—Since our last anniversary, several excellent maps have been received from Belgium, especially those by our associate, M. Vander Maelen; of which the principal are, the provinces of Brabant, Hainault, Liège, Luxemburg, and Namur: all of these maps are on the scale of $1\frac{1}{2}$ inch to a mile, and are well adapted for the use of travellers, as they exhibit the various railways, roads, and water communications.

France.—During the past year the hydrographic surveyors, under the late eminent engineer, M. Vincendon Dumoulin, have been employed on the coasts of Spain, Sardinia, and the west coast of Italy, and several sheets of these surveys have been published by the Dépôt de la Marine.

Of Spain, the south-west coast has been completed; of Sardinia, two sheets of the coast between Nice and Genoa have been published, which completes the survey of the coast of Liguria, under the direction of M. Daroudeans, who has also surveyed and published a beautiful chart of the Lipari Isles.

* See also page 135.

Of the west coast of Italy, the survey has reached the Bay of Salerno; charts have been published as far as the mouth of the Tiber: several sheets are far advanced in the hands of the engravers, which will appear in the course of the present year, and will include the Ponza Islands and the Straits of Messina.

The coast extending from near Amalfi, in the Bay of Salerno, to Monteleone in Calabria, has not been examined. For other accounts of the proceedings of French geographers I must refer you to the very full statement contained in the excellent report of our sister Institution, the Geographical Society of Paris.

We have also received 56 charts published by the *Dépôt de la Marine*, which have been incorporated in that valuable series.

Sardinia.—Three sheets of the large map of Sardinia have been added to our collections during the past year, making 78 sheets already published out of 91, of which the map is to consist.

Switzerland.—The Great Federal Map, as we are informed by our learned associate, Professor Paul Chaix, of Geneva, commenced about the close of the last century (1791) by Trelles of Berne, is nearly complete.* It is engraved on 25 sheets; the scale is $\frac{1}{100,000}$, or $1\frac{1}{2}$ inch to a mile.

Teer, the astronomer of Zürich, assisted by M. Sistälazzi and Professor Trechsel, conducted the survey to the year 1811, measured two base-lines and carried the triangulation over the cantons of Zürich, St. Gall, Appenzell, Thurgau, and the southern cantons.

In 1822 General Finsler surveyed the districts of Sargans (St. Gall), and conducted the survey until 1832, when it was considered necessary to connect the Swiss triangles with those of other countries, and especially with the Austrian survey.

In 1833 General Dufour succeeded M. Wurstenberger, and held a conference, at which it was determined that the map should be engraved on 25 sheets, each sheet 70 centimetres long and 48 broad, on a scale of $\frac{1}{100,000}$ of nature, corresponding to an area of 70,000 metres by 48,000 metres.

The Government of Lucerne has decided on engraving that canton, on a scale of $\frac{1}{35,000}$ or about 2·8 inches to a mile. The Canton of Glarus will be issued in about a year on a scale of $\frac{1}{35,000}$, but I regret to be informed that the Canton of Schaffhausen is not to be published as part of the Federal Map.

* The only sheet wanting (1860) is No. 13, and small portions of Nos. 8, 22, 23.

Among new maps are a geological map of Aargaurian Tura, by Casimle Mösche, scale $1\frac{1}{2}$ inch to a mile; and a geological map of the eastern part of the Grisons, by Professor Theobald, scale $\frac{1}{6}$ of an inch to a mile.

Professor O. Heer has published his "Flora Tertiaria Helvetiæ," in three vols., which our Associate, Professor J. M. Ziegler, has presented to the Society.

M. Studer has given some very interesting observations at Berne and its environs.

RECENT PUBLICATIONS.

Atlases.—The Royal Illustrated Atlas, by Messrs. Fullarton and Co., has reached its 20th part, and continues to merit the approval already bestowed upon it. The geographical notice attached to this Atlas renders it of value to the scholar.

Blackie and Son's Imperial Atlas is finished, and the parts containing the maps are published. The alphabetical index, containing 120,000 names, is now complete, and also exhibits great care and attention to detail in its valuable list of geographical positions.

The Royal Atlas, by A. K. Johnston, so well described by my predecessor in his Address of last year, steadily progresses. The 5th part, making in all 25 maps beautifully engraved, with an alphabetical index to each sheet, has been published, and comprises about half the atlas, which will be completed early in 1861. The hydrographical portion of each map being printed in blue ink, a single glance enables us to form an estimate of the relative proportion of land and water, in which particular it is in advance of its contemporaries. A new edition of the Geographical Dictionary and of the School General Atlas will be issued shortly. Of the series of large wall maps, noticed in the President's Address of 1858, Europe and Australia are published by Mr. Stanford; and Asia, Africa, North and South America, are constructed and in progress, Asia and North America being well advanced.

The distribution of maps, by a paper of so large a circulation as the 'Dispatch,' must tend materially to popularize geography. The maps, chiefly the production of some of our own members, are before us, and you will see that they form as comprehensive and cheap an Atlas as was ever produced.

Ceylon.—Since our last anniversary, Sir Emerson Tennent's elaborate work on Ceylon, published by Messrs. Longman, has appeared. The author has carefully examined into the physical geography,

the geology, the vegetable productions, the mineralogy, the zoology, and the natural history of the island, and to almost all these branches of science something new is added. The narrative, moreover, exhibits the state of Ceylon from the earliest antiquity. The work is illustrated by numerous maps, plans, charts, and drawings, and contains ample details of the form of government in the island, its revenues and expenditure, together with the principal sources of trade, especially the cultivation and export of *cinnamon*, and the more recent and eminently successful experiment of planting *coffee* on a grand scale.

New Zealand.*—Dr. Thompson is already known to us by his memoir on the "stature, bodily weight, &c., of the New Zealand race of men," read before this Society in 1852, and his present work is the result of an extended acquaintance with the regions in question. It is divided into three parts: the *first* gives a résumé of the physical features of the country and of the native inhabitants,—their laws, religion, warlike and other customs, their food and husbandry, their literature and domestic life; the *second* traces the various stages of European interference down to the present time; the *third* discusses the questions of their decrease and of the prospect of their future continuance.

Sources of the Nile.—Our Medallist Dr. Beke has resumed his pen and given us a volume, entitled "The Sources of the Nile, being a General Survey of the Basin of that River and of its Head-Streams, with the History of Nilotic Discovery," illustrated by a series of maps. Thirteen years have elapsed since we published two papers by Dr. Beke "On the Nile and its Tributaries." The whole has, however, been remodelled, and many important particulars are now published for the first time, by Mr. Madden.

China and Japan.—The "Narrative of the Earl of Elgin's Mission to China and Japan in the years 1857-58-59," by our associate, Laurence Oliphant, has been published since the last Anniversary, by Messrs. Blackwood. Mr. Oliphant furnishes us also with a concise account of his excursion to the Malay Peninsula, to which he was transferred in Malay sampans and hospitably received, and of his visit to the Philippine Islands. The first volume contains a lively and clear description of the various parts of China visited by the mission, with an account of the trade, manufactures, &c., of the people, and particularly of the ascent of the Yang-tse-Kiang

* "The Story of New Zealand, Past and Present, Savage and Civilized." By A. S. Thompson, M.D. 2 vols. Published by Mr. J. Murray.

in H.M.S. *Furious*, commanded by Captain Sherard Osborn, R.N., F.R.G.S., an account of which will appear in the 30th volume of our Journal. The second volume treats of Japan and of the country and inhabitants generally, and abounds with interesting information with regard to that little known empire.

Siberia.—I have just been informed that our associate, Mr. Atkinson, so well known for his extensive travels in Russia, is shortly to publish a second work on Siberia.

Eastern Africa.—Consul M'Leod's "Eastern Africa, with the Narrative of a Residence at Mozambique," in 2 vols. Messrs. Hurst and Blackett.

Slowly but increasingly of late years the attention of Europeans has been drawn to the immense resources of Eastern Africa and the importance of redeeming that prolific region and its swarming inhabitants from the curse under which they are laid by the slave-trade. The Portuguese claim possession of the coast from the town of Lourenço Marques on the northern side of Delagoa Bay, to Cape Delgado. Within this range of 15° of latitude lie the mouths of the Zambesi where Dr. Livingstone is now pursuing his heroic enterprise, and southward, just within the Portuguese limits, the mouth of the navigable river Mouakuse, supposed to be continuous with the Limpopo, which forms the northern limit of the Transvaal Republic. Between the two rivers lie the Sofala river, town and territory which Mr. M'Leod identifies with the Ophir of Scripture.

This work, besides giving a statement of the Portuguese settlements in East Africa, supplies valuable information relative to the African dominions of the Imám of Muskat, the island of Madagascar, and the other islands of the Ethiopian Archipelago. The last portion of the work enters fully into the commercial resources of Eastern Africa.

The Travels, Researches, and Missionary Labours of the Rev. L. Krapf have been published by MM. Trübner and Co., and include also the journeys of the Rev. J. Rebmann and the Views on the Resources of the Wanika, by the Rev. J. Erhardt. To these is prefixed an account, by Mr. E. J. Ravenstein, F.R.G.S., of Geographical Discovery in Eastern Africa.

Manual of Geography.—The best testimony to the merits of Mr. W. Hughes's Manual of Geography is supplied by the fact of the numerous editions which have been successively called for within a recent period. The leading idea which its author has sought to embody in this volume, is the connection of physical geography with the indus-

trial pursuits and social condition of nations, or, in other words, the *geography* of industry and commerce, viewed as dependent upon the natural features, climate, and productions of the various regions of the earth.

Encyclopædia Britannica.—The *Eighth Edition* of this great work is in course of publication by Messrs. Adam and Charles Black of Edinburgh, and is nearly completed. It will comprise twenty-two quarto volumes, illustrated by upwards of five thousand engravings on wood and steel. The articles have been carefully revised and carried up to date, and a reference to the list of the principal contributors is sufficient to stamp the value of the work.

New Granada, Equador, Peru, Chile, etc., by Mr. Wm. Bollaert, F.R.G.S.—This work, dedicated to Sir Roderick I. Murchison, will shortly appear. The author is already known to us by his papers published in our Transactions.

Ruins of Carthage.—Mr. Davis has been engaged since 1856 in excavating the ruins of ancient Carthage and Utica, and the objects of antiquity he has discovered are now being arranged in the British Museum. At the close of his excavations he visited the sites of other ancient cities.

Map-Projections, etc.—We have received two map-projections, one by Sir John Herschel, the other by Col. Sir H. James. Also an interesting paper on a method of observing the lunar distance, by Col. G. Everest. These will be printed in our Journal.

Great-Circle Sailing.—Two mechanical methods of solving problems in great-circle sailing have been published. One by Captain W. C. Bergen, of the mercantile marine, is by charts of the gnomonic projection. This method is considered by Mr. J. W. Share, R.N., to be the most satisfactory, expeditious, and accurate of all the mechanical methods that have been hitherto devised. A *straight line* ruled across any part of these charts represents the arc of a great circle.—The other by Capt. Berger, also of the mercantile marine, is termed the "Patent Sphereometer," invented for the purpose of obviating all abstruse calculations in great-circle sailing. It consists of a hollow hemisphere of wood, coated over with a slaty composition, on which are marked only the parallels and meridians: a graduated, moveable brass meridian serves to measure the distance between the two places. The various courses are ascertained by a brass protractor, fitted to the sphere.

Star Maps.—A new edition of the six maps of the stars on the gnomonic projection, designed and constructed by Sir J. W. Lub-

book, and published in 1844, under the superintendence of the Society for the Diffusion of Useful Knowledge. This new series is edited by Mr. Charles O. Dayman, A.M., and contains all the objects in Vice-Admiral Smyth's cycle.

An atlas will shortly be published, containing four maps of the stars and two maps of the world, on Sir Henry James's geometrical projection of two-thirds of the sphere; with a table, for the construction of maps on this projection, on any scale that may be required. The celestial maps on this projection possess the peculiar advantage of presenting at one view the two poles and all the circumpolar stars within 47° of one pole, and all those within 125° of the central meridian.

Finally, it affords me great pleasure to notice the successful progress of this Society during the past years, which has been the subject of comment in the several Council Reports submitted to the Fellows at the Anniversary meetings, and may be seen at once by comparing the income, which amounted, ten years ago, to only 778*l.*, while in 1859 it reached 3471*l.* During the above period, 3000*l.* has been expended on the Library and Map-Rooms, and furniture and fittings, besides which a sum of 2500*l.* has been added to the Permanent Fund.

The result of these ten years may be thus briefly stated:—The collections in the Library and Map-Rooms have more than *doubled*, the number of Fellows has more than *trebled*, and the income has increased *five-fold*. In 1849 the revenue admitted of an outlay of less than 100*l.* on publications; in 1859 it warranted an expenditure of little short of 1000*l.*

Sincerely do I congratulate you on this state of your affairs. The progress of the Society of late years has been rapid, but at the same time steady and continuous. Our increasing numbers, the large attendance at our meetings, the character of the communications which we receive,—all tend to prove that the labours of the Society are widely recognised and appreciated. And, as it seems to me, it ought to be so; for I know no country in the world to which the results of geographical investigation are calculated to be of greater value than they are to England. With an empire that extends to every quarter of the globe, and embraces within its rule almost every variety of the human race, and with a commerce that fills every sea and occupies every port, the English have, perhaps,

PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY
OF LONDON.

SESSION 1859-60.

Thirteenth Meeting, June 11th, 1860.

LORD ASHBURTON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Bernard Dietz ; Edward M. Elderton ; and Robert Rintoul, Esqrs., were presented upon their Election.*

ELECTIONS.—*The Bishop of Labuan ; the Rev. R. Miles ; the Rev. J. J. Stewart Perowne ; Professor H. D. Rogers ; Lord Seymour ; the Earl of Southesk ; Commander F. H. Stirling, R.N. ; Lord Stratheden ; James Brown, M.P. ; C. J. Bunyon ; W. H. Cooke ; M. E. Grant Duff, M.P. ; George Eliot, C.E. ; Thomas Fox, M.D. ; F. Haworth ; Hamilton Hume ; Brinsley Nixon ; Arthur Paget ; and Arthur Giles Puller, Esqrs., were elected Fellows.*

The Papers read were—

1. *Boat Excursion from Bangkok to Pecha-buri ; and 2. General Report on the Trade of Siam.* By Sir R. H. SCHOMBURGK, Corresponding F.R.G.S., Her Majesty's Consul in Siam.

1st. SIR R. SCHOMBURGK having suffered from indisposition during a lengthened stay at the consulate in Siam, resolved to make an excursion to the town of Pecha-buri, and furnishes in the present paper a graphic narrative of the expedition. He made his way in his barge through canals, until he reached the sea at the town of Meklong, and thence he coasted in her round to the mouth of the Pecha-buri River. There were many signs of industry along the banks which he ascended,—fish-curing, lime-burning, salt stores, and numerous flower-gardens. He was received with hospitality by the Governor of Pecha-buri, who showed him some native entertainments, and among others a bull-race—the bulls being attached to carts. He says the structure of the racing-cart is strikingly similar to the one represented in the bas-reliefs of the remains of Nineveh in Layard's 'Popular Account of the Discoveries

of Nineveh.' The bulls are harnessed to the end of the pole, they are guided by reins drawn through the nostril, and the drivers stand upright with remarkable steadiness. The enthusiasm of the people at these races was immense. There are numerous cave temples at Pecha-buri well worth visiting, though not of an equal scale to that of Ellora.

2nd. It must be observed that, with the exception of the Gulf of Siam, of which the greater portion has been recently surveyed under the able direction of Mr. J. Richards, of Her Majesty's surveying-ship *Saracen*, the position of places in the interior rests upon no fixed data, and the existing maps of Siam are very erroneous, in many respects having been projected merely upon conjecture.

The geographical position of this country is of great importance in a political respect, as it occupies the centre of India beyond the Brahmaputra, bordered on its immediate eastern frontier by Cochin China, and beyond that country by the Celestial Empire or China.

Taking into consideration its western limits, Siam Proper is bounded by the territories of a number of petty princes, who aim at independence, but cannot maintain it without paying some kind of tribute to the Kings of Siam, thereby acknowledging their sovereignty.

This refers principally to the Malayan peninsula, under which name I understand that strip of land extending from the British Tenasserim provinces to the point of Romania, bordered on the west by the Bay of Bengal, and on the east by the Gulf of Siam. This isthmus has near its base—namely, between Banlam in the Siamese Gulf and Tavoy Point at the Bay of Bengal—a breadth of 117 miles, and at its narrowest point scarcely 50 miles.

One of these narrow necks, between the river Xumphon or Champon and the Pak Chan at the Bay of Bengal, has been proposed for piercing a canal from that Bay to the Gulf of Siam, thus avoiding the great circuit of vessels bound from the principal ports of our Eastern empire to China; moreover thereby steering clear of the great dangers which the passage through the Straits of Malacca offers to vessels coming either from Calcutta and Bombay, or from Europe, bound for China.

The construction of a canal, deep enough for ships, through the Isthmus of Kra, as this neck of land is called, seems to offer no great difficulties, according to the information which I have received from His Excellency the Kalahome or Prince-Minister of Siam, who recently has visited the locality. His Excellency has, I fear, given to me rather too favourable a description of the labour required to

construct a canal for sailing-vessels of a draught of 16 feet; so that without farther investigation it is not implicitly to be trusted.

The Gulf of Siam is destitute of fine harbours; the larger rivers are obstructed by sandy bars which prevent vessels of a greater draught than 13 feet to cross the same. This refers likewise to the Menam, the principal river of Siam, on the banks of which lies Bangkok, the capital of that kingdom.

The Menam possesses three outlets: the bar of the deepest branch has only a depth of 3 feet at low water; and as the tide at springs amounts to 10 feet, larger vessels of a deeper draught than $11\frac{1}{2}$ feet can scarcely venture to cross it.*

It is customary that ships bound for Bangkok to take in cargo proceed to that port, where they load to $11\frac{1}{2}$ feet, and return afterwards to the roadstead outside the bar, where they fill up.

The distance from the roadstead to the anchorage of Bangkok is, following the windings of the river, about 33 nautical miles. After the ship has passed the bar and has reached the mouth of the river, distinguished on its right or western bank by a small mount, the water deepens. About 3 miles higher up lies the town and port of Paknam, the seat of a governor. The place is fortified, and upon a sandbank which rises out of the water near the western or right bank of the river batteries and other fortifications have been erected.

The shores of the river Menam are fringed with forest-trees, and here and there a habitation surrounded with orchards. Behind that fringe there are sugar and rice fields, extending for a considerable distance inland.

About 6 miles above Paknam lies, on the right bank of the river, the settlement of Paklat; its inhabitants consisting principally of Peguans, who during the war between Siam and that country were led by the Siamese into captivity. The number of inhabitants of Paklat has been estimated at seven thousand.

Immediately above that settlement the river makes a great turn, describing almost a circle; the land being, at its shortest extent, not much more than half a mile in breadth, while following the course of the river it is about 10 miles. A canal, only deep enough for boats, passes from Paklat to the upper part of the bend or Upper Paklat, but the same has not been constructed through the narrowest neck.

This canal, on both its banks, is studded with houses, among

* The bar is composed of sand, soft on the southern side and hard on the northern. It has the form of a horse-shoe.

which are some pagodas or wats, remarkable for their extent and architecture.

The banks of the river on both its sides about half-a-mile beyond Paklat are occupied by some extensive fortifications, principally on the right bank. The fort on the left is of less importance, but attached to it is a strong beam, which can be thrown across the river to impede the passage of any hostile vessel.

The river itself offers from here, as high up as the Palaces of the Kings, sufficient depth for the largest ship, were it possible to overcome the difficulty at the bar: as great a depth as 13 fathoms are occasionally found in that distance.

Merchant-vessels anchor usually between the British Consulate and the First King's palace, in from 5 to 8 fathoms of water. As some mercantile establishments are situated on the left bank of the river below the Consulate, vessels may likewise be seen in that direction.

The river Meklong has been considered by some a branch of the Menam. This is, however, erroneous: although at its lower part, near its mouth, it is joined by an arm of the Menam. The soil along the Meklong is extremely fertile; producing rice, sugar, sesamum or til-seed, besides numerous fruit-trees bordering its banks.

A great number of the inhabitants who live at the lower part of the river occupy themselves with the preparation of salt, which they obtain by evaporation. Not only is a great part of Siam supplied from here with this article, but a large quantity is likewise exported.

The town of Meklong is some distance up the river, but it can only be reached in small boats.

Banlam may be called the seaport of the district of Pecha-buri; the town of that name, likewise called Phiphri, lies some distance up the river, but the latter is too shallow to admit of large vessels coming up as high as the town.

The province is fertile, and furnishes a large quantity of rice for export, which, in a great measure, is conveyed by coasting-vessels direct to the roadstead of Bangkok, and taken there on board of the foreign vessels at anchor.

Bangplasoi is at the eastern bight of the Gulf of Siam, and about 6 miles to the south of the river. Bangpatung has a tolerable good harbour for vessels of a moderate draught.

The Bangpatung flows through a fertile country, well cultivated. The produce of its banks is principally sent to Bangplasoi, a town

in which resides the governor of the district, and which numbers, according to the information which I received from that official, about 3500 inhabitants—of whom 2000 are Chinese. Its port, if such the anchorage can be called, is quite safe for craft of a small draught, but does not admit vessels of a larger description.

The eastern coast of the Gulf of Siam abounds in fish, and not only a large number of the inhabitants of Bangplasoi, but likewise those of the village of Anhin, about 9 miles to the south of the former, occupy themselves with catching and curing the fish, which they convey to Bangkok.

Between Anhin and Bangplasoi there are extensive rice-fields; the low ground, easily subjected to irrigation, being advantageous to the cultivation of that grain. Til-seed (*Sesamum indicum*) is likewise raised and sent to Bangkok.

The village of Anhin, in lat. $13^{\circ} 21' N.$, long. $100^{\circ} 55' E.$, is famed for its salubrity. The First King and his court spend here generally some time to enjoy the sea-air. Not only His Majesty, but likewise some of his ministers, possess houses in Anhin, and the King has given orders for building an extensive residence.

A sojourn at Anhin is principally recommended to those who suffer from dysentery or diarrhoea,—maladies to which foreigners, Europeans and Americans, residing in Bangkok, are much subjected, and which prove but too frequently fatal.*

About 11 miles to the south of Anhin commences a group of islands, to which the name of the "Dutch Islands" has been given. Kisi-chang is one of the largest of the group, possessing a fine harbour; to which, in the case of severe weather, the shipping at the roadstead of Bangkok retire for safety. The inhabitants cultivate yams, sweet potatoes, but principally maize or Indian corn.

The harbour of the island of Kisi-chang has been recommended as a naval station, affording complete shelter. A fine stream of fresh water, which falls into the bay, furnishes, moreover, the facilities for watering.

These islands are famed as the resort of the swallow which constructs the edible birds'-nests, which are considered such a great delicacy by the Chinese and likewise by European gourmands.

The swallow (*Hirundo esculenta*) builds these nests in caves formed in the limestone rocks of which these islands seem to consist. This calcareous formation is reported to contain rock-crystals, and Bishop Pallegoix, who visited Koh-sichiang, speaks in high praise of the

* I can attest from my own experience to the great benefit which I received, when suffering under dysenteric diarrhoea, from a sojourn at Anhin. The First King styles it a Sanatorium for white people.

beautiful marble which he found there "polished by the waves of the sea as brightly as if it had been done by the hand of man." *

Chantaburi is considered, among the ports of Siam, only second in commercial importance to Bangkok. The town itself is about 11 miles up the river, following its windings, and is the residence of a governor.

Siam claims sovereignty over Cambodia, and its king pays tribute to the Siamese Court. A similar claim is preferred by Cochin China.

The country is very fertile and of great commercial importance. It produces rice, pepper, sugar, and its forests yield spontaneously gamboge and other gums, ornamental woods, &c.

Kampot is the only sea-port of the territory.

Turning now to the harbours and anchorages of the western coast of the Gulf of Siam, or Malay Peninsula, they are very imperfectly known. It is to be regretted that a detailed survey and examination by Her Majesty's surveying-ship *Saracen* did not extend to that coast.

As I have already observed, the rivers of Siam are usually obstructed at their mouth by bars of sand, and the shore seems devoid of sufficient indentations to form secure ports for affording shelter to vessels of a larger draught than 5 feet during tempestuous weather.

The PRESIDENT observed that this country was of great interest to us, on account of the promising commercial relations which were in view, and also on account of the people, who seemed to take more kindly to the ways of civilization than the other inhabitants of that peninsula.

Mr. J. CRAWFORD, F.R.G.S., said it was forty years since he was in Siam, and what he had written on the subject had been copied over and over again. Sir John Bowring had produced a much more recent work, abounding with excellent information. With respect to Sir Robert Schomburgk's communications, he was particularly pleased with the last paper that was read. Every word of it ought to be published. It contained sound and reliable information. He had been himself nearly over the whole ground, and he could vouch for the perfect accuracy of Sir Robert Schomburgk's information. Siam was a peculiar country, inhabited by a peculiar race of people. It extended from the boundaries of Bengal to the western boundaries of China. The people were less civilized than the Hindoos, and incomparably less civilized and less industrious than the Chinese: all of them, except a few, were in a state of very great barbarism, professing the Buddhist religion—the doctrine of the metempsychosis—hating to kill all animal life, except the life of man, which they did not particularly respect. The population was estimated at six millions, but among these six millions there were a million and a half of Chinese. It was an exceedingly fertile country, and productive of many useful articles. In touching upon the production of cotton, Sir Robert Schomburgk had hit upon

* 'Description du Royaume Thai ou Siam.' Par Mons^r. Pallegoix, &c. Paris, 1854, vol. i. p. 69.

the very place where sea-island cotton might be produced—a far better cotton than we could get from Africa. The staple of the country was rice, which was exported in very large quantities to Singapore, and at the present moment to China, where, owing to existing disturbances, it was much needed. Another production was sugar, an article which was only introduced into the country about twenty years before his visit, but which was now quoted in the London 'Price Current.' Another article which the country produced was what was called in the Custom House returns "tea;" it was brought to this country in large quantities, and, after the oil was extracted, it formed a capital material for fattening cattle.

The PRESIDENT said no man was better able than Mr. Crawford to give information with respect to this country, and any words of his in approbation of the papers of Sir Robert Schomburgk must be entitled to consideration. Still, notwithstanding Mr. Crawford's low estimate of the civilization of the people, he ventured to think they were capable of improvement, for they were conscious of their defects, and quite ready to adopt our improved methods of cultivation. Moreover, the King was a man of considerable intellect, and was doing everything in his power both to extend trade and to develop the industry of his people.

MR. CRAWFORD said the two kings of Siam, when young men, were confined in a monastery, their elder brother (a natural son of the king, whom he had the honour to be presented to when he was in Siam) having usurped the throne. Upon his death, the nobility assembled and insisted upon the legitimate son being elected; but such was his affection for his brother, that he would only consent to reign on condition that his brother was elected along with him. It was the eldest who had so distinguished himself, and who made the treaty with Sir John Bowring. He understood our language perfectly, and wrote it very well. The American missionaries, led by Dr. Judson, had converted forty thousand of the Siamese to Christianity: a greater number than in the course of a hundred years we had been able to convert in India or China. The territory which had been ceded to us, and was at the time thought to be a bad bargain, had turned out to be quite the reverse; and at this moment it was, he thought, one of the most prosperous portions of the British empire.

CAPTAIN SHERARD OSBORN, R.N., F.R.G.S., said, that ever since Major Yule's remarkable paper on Burmah, in 1857, he had felt an interest in the question of finding access to the western states of China by the group of rivers that come down from the north-west shoulder of the Tibetan range, the Mekong, the Menam, and the Salwin. They all took their rise in the province of Yunnan, in Western China, a province as extensive as Spain. He approached it within 600 miles, when he ascended the Yang-tse-Kiang. Its products were abundant, and some of the finest teas in China were produced there. It was described by the Chinese as an elevated plain, bounded on the north by the great mountains of Tibet, which rise into the Snowy range. Through this great plain ran three different rivers, separated from each other by spurs of mountains. The Mekong, which was decidedly the most important of the three, no doubt, split the province of Yunnan into two, and ran directly south from it. The mouth of this river is now in possession of the French. He fancied that by these rivers we might obtain communication with the western provinces of China, and he had no doubt if this Society were to point out to travellers and missionaries the importance which would attach to the opening up of this communication, in a commercial and geographical sense, and it were set before them as a specific object, that before long we should succeed in reaching the western provinces of China by that route.

COLONEL W. H. SYKES, F.R.G.S., said he believed there was already a communication between Siam and the western provinces of China, for the people

of Aracan got their opium from Yunan. It only required to extend that communication, as Captain Osborn suggested, in order to get the most profitable results. With respect to the King of Siam, Mr. Crawford had not done full justice to his acquirements. He was also a good Latin scholar, signing his name with Latin terminations; and the cards which he sent out quite rivalled any bridal cards he had ever seen.

MR. LAURENCE OLIPHANT, F.R.G.S., stated that Brigadier M'Leod had crossed from Moulmein into Yunan, with the object of diverting, if possible, a portion of the trade, which found its way down the Menam, to our settlements in the Bay of Bengal. The allusion in the paper to the bars at the mouths of these rivers was very important. The principal of these rivers was the Mekong, and the flag-lieutenant of the French admiral had informed him that it was the only river which he knew of in that part of the world, where there was no bar, and that there was twenty-eight feet of water on it. The importance, therefore, of that river was very evident.

The third Paper read was—

3. *Geographical Observations on Western Africa.* By DR. DELANY and MR. R. CAMPBELL (Gentlemen of Colour).

DR. HODGKIN introducing these gentlemen observed, that the writings of Livingstone, whom this Society has so warmly supported, became known to the coloured people of America. They longed for the regions which he had described, and a company of free Negroes on the American soil wrote a letter to Dr. Shaw, dated Maddison, Wisconsin, May, 1858. That letter was placed in my hands, as one of your secretaries, to answer. I endeavoured to give the best information in my power in reply to the several points contained in it. The result was, that one coloured man, J. Mayers, went, at his own charge, with his son to the Cape, coming to England by the way, when I saw and advised with him. He has written to me from the Cape, and from Natal, and is now in the United States.

Two other coloured gentlemen of enterprise—a second Caleb and Joshua, it may be—went to the western coast of Africa, towards the headwaters of the Niger. The one, Dr. Delany, went to Liberia, on his way to Lagos; the other, R. Campbell, came to England; and through the benevolent aid of one of the Fellows of this Society, H. Christy, and of some others of our countrymen, found means to equip and go to Lagos, where the travellers met, and commenced the journey which they will presently describe.

I have only to add, that though the company of free American coloured persons looked to England almost exclusively, they have been aided by benevolent persons in America, and a society has been formed there, of which the secretary and agent, T. Bowren, is now in this country and attending your meeting, watching the interest which his coloured friends will excite as earnestly as would his English father have done were he alive and still carrying on his advocacy in favour of the sons of Africa.

DR. DELANY's travels in Africa commenced at Grand Cape Mount, Liberia, where he visited every settlement except Carysburg, and traversing in part Stockton Creek, the Messurado, St. Paul, Junk, and Kavalla rivers, to Cape Palmas, and from thence coasting to Lagos in the Bight of Benin.

From Lagos, by the Ogun river, he reached Abeokuta, and thence

to Ilorin, a great Mahomedan city, populated by Houssas, Fulines (the Fullotahs of Denham and Clapperton), and Yoruba; the Fulines being the ruling people, though the Houssas are most numerous. The three languages are spoken in the Court, messages being made to the officer in Yoruba, conveyed to the King in Fulines, and answered by him in Houssa, the reply being returned in Yoruba. The route, on returning, was through Oyo, Iwo, and Iboddan, many towns and villages intervening between the large cities named through which they passed.

Granite, quartz, and limestone form the principal strata of these plateaus, and iron abounds in every region, each town of any note having iron-smelting establishments. The Grand Paul Mountains—the southern extremity of the great mountains of Kong—in the Webo, Kabo, and Dibo countries, forming the northern limits of Liberia, are composed of masses of quartz, as far as the eye can scan, towering from peak to peak like great white heaps of snow-capped summits. These quartz strata extend into Liberia, within ten miles of Abourovia, on the St. Paul. Iron about Monrovia is abundant, the town seeming to rest on a solid mass of iron-ore; some parts of Ashman-street show traces of the mineral. Mica also abounds.

The climate is good and frequently salubrious, the thermometer ranging from 70° to 90° Fahr. During the Harmattans—a dry, cold north-easterly wind of from two to four weeks' duration (and not a "dry, hot wind," as mistakingly called by some writers) in December and January—the mercury falls as low as 54° Fahr., when it in consequence is very cold, but seldom reaches 90°; the average temperature being 85° Fahr.

The diseases are simple and easily treated when properly understood by intelligent medical men. Intermittent fever, with various modifications of bilious, remittent, continued, and inflammatory, comprise the principal medical—and ophthalmia, from taint, and hernia those of surgical—diseases. Inflammatory is the worst type of fever known to these places: it doubtless being that which recently prevailed with such sad mortality in Freetown, Sierra Leone.

The soil throughout varies from a rich alluvial to a sandy loam, with ample capacity for every tropical production.

The woods are numerous, and, although as yet not scientifically nor well classified, from practical use enough is known of them to decide their quality for domestic purposes in building and furniture architecture. This has been fully tested in the Webo, Kabo, and Dibo countries, where they make a handsome native chair of a

beautiful straight-grained, smooth red mahogany; also in Liberia, Egba, and Yoruba.

The acasia or senna, jalap, castor and croton oil, and nux-vomica plants and fruits are abundant; also what Dr. Delany calls gum Yoruba; the same as gum Arabic, is found in these regions. Though not a medical article, the gum-elastic tree is a flourishing native plant.

The cattle are of two distinct classes, with contingent modifications: the Mandingo, or "windward," a very fine, tall, well-proportioned, long-horned ox, an exact type of that peculiar class of English-bred beeves; and the Golah, or "leeward," a large, heavy, short-legged, and short-horned animal, closely resembling the British-bred Durham. Their modifications consist of an undergrowth of the Golah, generally found about Monrovia, and a mixture seemingly of the Mandingo and Golah, producing an animal larger than either, with a modified conformation of both. The male of this mixed class is a huge animal of almost elephantine proportions, having gradually rising shoulders like those of the Brahmin bull. These cattle are very gentle, and generally attended in the Egba and Yoruba countries, when in large numbers, by herdsmen: the cows producing excellent milk and butter.

There are two classes of horses, with a modification. The Sudan (known as the Arabian horse) is a noble animal of from twelve to fourteen hands high, well proportioned, symmetrically beautiful, and a type of the description given to the sire of the great English-bred "Godolphin," the first blooded-horse. The so-called Arabian horse abounds in the region of our travels; their original nativity being Sudan, from whence the Arabs, purchasing them in large numbers, send them to Europe as their own production.

The Yoruba horse, a small animal, is equal in size to the largest American-Indian pony, and is generally what is termed in America of a "mouse colour." They are very enduring and the best adapted to travel in the present paths and roads of Africa. The modified is a mixture of both classes, being an animal of various proportions and colours, from the size of the Yoruba nearly to that of the Sudan horse.

The swine, which present two distinct classes, consist of the Guinea—a short-nosed, short-eared, full-headed, heavy-bodied animal—favouring the English Berkshire; and a domesticated descendant of the wild hog—a narrow-faced, long-nosed, long-eared, tall, slender brute—a type of the American species. These have their minor modifications, producing an intermediate class.

The popular deity in the Yoruba and Egba nations is Sango, represented by a ram's head or a black ram; being the god who avenges by fire called from heaven. This is precisely typical of Jupiter Ammon, the god of Egypt, represented with ram's horns, seated on a throne of gold and ivory, attended by a phoenix (some call it an eagle) with extended wings, grasping in his right hand the thunderbolts of heaven and holding in his left the sceptre of universal power. Sango is always represented as elevated and being all powerful among the people.

Dr. Delany finally mentioned that the adventure originated from a large portion of the intelligent and educated descendants of the Africans in the United States and the Canadas, who are anxiously desirous by their own efforts and self-reliance to regenerate their father-land.

LORD A. CHURCHILL, M.P., F.R.G.S., said he was interested in the movement which had brought his friend Dr. Delany to this country, and he purposed in a very few words to explain its object. There were some four millions of slaves in the United States, and they were kept entirely for the production of articles of commerce, of which England consumed a very large proportion. There were also in the North and in Canada a great number of free men of colour, and many of them were gentlemen of high and liberal education. The object in which many of the coloured free men of America were now engaged was to regenerate and civilise their own continent. The expedition up the Niger, five-and-twenty years ago, failed in consequence of the climate being too severe for European constitutions. An effort to open up the country was about to be made again by these free men of colour in the United States. Their constitutions were well able to stand the heats of the climate. The head of the Society which had undertaken this movement was the Rev. H. Garnett, a gentleman well known in the United States, and Mr. Barnes, a commentator on the Scriptures. Mr. Campbell and Dr. Delany had been sent over by the Society to endeavour to make terms with the native chiefs, and he was happy to say they were on their way back after having concluded a most satisfactory treaty with the King of Abeokuta, and also made amicable settlements with the native chiefs of other districts, for the purpose of enabling men of colour to return to that country and settle there, and enjoy all the rights of citizenship. He believed that by this means a great and strong blow would be struck at the slave-trade, and that it would at the same time lead to the production of one of the great commodities which we required in this country—that was cotton. Cotton was one of those materials, the growth of which we ought to encourage in all parts of the world, for next to food it was of the greatest possible importance to us.

MR. HANSON, H. M. Consul at the Sherboro (a gentleman of colour), said it struck him that in speaking of the civilisation of the African race, we were apt to overlook the fact that there were large populations in that country, and to suppose that the first thing we had to do was to populate the country in order to develop its resources. He believed the population of Africa was somewhere about 90,000,000, and, therefore, the 3,000,000 or 4,000,000 in the United States would be but a drop in the bucket. There was an aspect, however, in which the return of the negro population from America was to him of the greatest importance. If, instead of going to Africa to constitute separate communities, the people who came from America would incorporate themselves into the

indigenous race, and seek to elevate them by their superior information and knowledge of the arts, then no doubt great good would result. With reference to the subject of cotton, it was too late to challenge a discussion on the subject; but he believed he was quite right in saying that Africa was the home of the cotton-plant, and that it surely could be produced in a country to which it was indigenous. It was well known that cotton was grown and manufactured up the valley of the Niger as far as Mungo Park went, and also in the regions which Dr. Delany visited, and again in the neighbourhood of Sierra Leone, as well as up the valley of the Senegal and the Gambia. He was not presumptuous in stating these facts, because he had gone over a great portion of the country to which he had referred. If the Negroes from America, who had been well disciplined in the best modes of cultivating cotton, would go into Africa and teach their native brethren what they themselves had learned, some of the gentlemen present might live to see the day when a great portion of the cotton, now supplied by the United States, might come to us from Africa.

SIR RODERICK MURCHISON, V.P.R.G.S., next called attention to the presence of two Maori chiefs from New Zealand, who had been brought to Europe by Dr. Hochstetter, of the Austrian expedition, in the frigate *Novara*. They had been to Vienna, and Dr. Hochstetter had brought them to this country to see them off to their native land, for which they would embark in a few days. When Dr. Hochstetter mentioned the circumstance to him, he thought the Fellows of the Royal Geographical Society would like to see these gentlemen, and he for one confessed he should like to hear one of them address the meeting for a few moments in his own native language. Dr. Hochstetter informed him that they had been taught how to print, and that in Vienna every step had been taken to instruct them in the various arts of life. Dr. Hochstetter then introduced the chief Toe-Toe, who addressed the meeting in a few words in his native language.

The PRESIDENT finally announced that Captains Speke and Grant had started on their expedition to Eastern Africa, and stated that since they had left this country they had found out that there were dangers to be encountered of which Captain Speke was possibly not aware. During only two months of the year would he find boats on the White Nile to take them into more civilised parts, but should he chance to arrive in any of the other ten months, he would not meet with that mode of conveyance and would be exposed to great dangers. Consul Petherick, from Khartúm, could meet him with a large force and escort him through the country, but Consul Petherick could hardly be expected to do this at his own expense; and as the Government declined making any farther grant, the Council of the Society had departed from their usual rules, and had headed a subscription with 100*l.* towards defraying those expenses. He only hoped that many gentlemen would contribute towards so good and so just an object.

SIR RODERICK MURCHISON said he had only to add that when Captain Speke had reached the most northerly extremity of Lake Nyanza, he would have to traverse two or three degrees of latitude through most hostile tribes, whose territory no traveller had yet succeeded in passing; and it would be found almost impossible to provision the party accompanying him, unless he was assisted from the north by Mr. Petherick, whose knowledge of the country, language, and habits of the barbarous tribes near the Equator, would prove of the very greatest value to this most important expedition.

Fourteenth Meeting, June 25th, 1860.

SIR RODERICK I. MURCHISON, VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*Isidore Gerstenberg; Arthur Giles Puller; and Augustus Henry Smith, Esqrs., were presented upon their Election.*

ELECTIONS.—*Commander Charles E. Forbes, R.N.; the Rev. Cosmo Reid Gordon; Captain Samuel Hyde; and Henry James Dunell; Francis Thomas Gregory; Thomas Longridge Gooch, C.E.; Herbert Ingram, M.P.; William Crichton Maclean; John Septimus Roe, Surveyor-General, Western Australia; Henry Brinsley Sheridan, M.P.; James Lowther Southey; James Watson; Thomas Matthias Weguelin; and Thomas Wilson, Esqrs., were elected Fellows.*

Captain the Hon. H. A. MURRAY, R.N., F.R.G.S., read the following letter from Consul Petherick on the subject of his proposed offer to proceed southwards from Khartúm, in order to meet and assist the expedition under Captains Speke and Grant:—

8, Cork-street, June 19th, 1860.

MY LORD,—In consequence of the refusal of Her Majesty's Government to support the application for pecuniary assistance made on my behalf by the Royal Geographical Society, for the purpose of enabling me to meet Captains Speke and Grant with an armed escort, and to furnish them and their party with provisions and the means of transport down the Nile, and the Council having liberally headed a subscription with 100*l.*, to which your Lordship has invited the Fellows of the Society to add their names, a few remarks upon the following two subjects will not be out of place:—

1st. The nature of the assistance I should propose to give Captains Speke and Grant to contribute to their safe return down the Nile, and the expenses thereof.

2nd. The probable expense of an independent Expedition from Khartúm to follow up the course of the Nile to its source, in combination with the aid to Captains Speke and Grant, as stated above.

In order to afford the greatest possible assistance to the Expedition of Captains Speke and Grant, I consider it necessary to place three well-provisioned boats, under an escort of twenty armed men, at the base of the cataracts beyond Gondokoro, in the month of November, 1861.

With forty armed men, natives of Khartúm or the adjoining provinces, I then would undertake personally to penetrate into the interior as far as the Lake Nyanza, with a view to effect a meeting

with the Expedition and assist it through the hostile tribes between the Lake and the Nile, and return thence by the boats to Khartúm.

Should I be unsuccessful in meeting with the Expedition, I would then endeavour to establish beyond a doubt whether or no there was any connection between the Lake and the Nile.

If it should be considered desirable, and my means were sufficient, I would proceed along the western shore of the Lake to the extreme point of Captain Speke's late discovery, so as to connect, by a series of observations, North with South Africa; after which, having met the Expedition or not, I should return to my boats at the cataracts and thence to Khartúm.

I believe that, with the facilities at my command in the shape of boats and arms, the expense of such an expedition would amount to about 2000*l*.

In the event of so large a sum not being available, I would then propose to place two well-provisioned and armed boats, under the superintendence of one of my own men, on whose integrity I could confidently depend, to await the arrival of the Expedition at the above-named cataracts from November, 1861, until June, 1862.

This precaution I consider most important to the success of Captains Speke and Grant, and the expense would be, on a moderate calculation, 1000*l*.

Sixteen years' experience on the Nile, and the brilliant examples of illustrious countrymen, have created in me the desire and ambition, that by placing my experience at the service of the Royal Geographical Society, I may aspire to the proud eminence of adding to British glory by assisting in the discovery of the sources of the Nile.

Single-handed, unfortunately, I have not the means to achieve it, other important interests compelling me to devote my attention to regions which I have had the honour to make known to the Society; but if so far in the enjoyment of the confidence of the Royal Geographical Society and the nation, as to obtain sufficient support, I feel that in me, which will command success.

It strikes me forcibly that the most feasible method of accomplishing the object above stated, is to follow the stream.

For this purpose I would supply myself with a boat, either by taking out one in parts from this country, or by constructing one on the spot; the materials for which, with the exception of timber,—that being abundant in the locality—I would take with me, as well as also artisans from Khartúm.

The men and materials I would endeavour to place above the cataracts early in 1861, so that in November of the same year,

with the setting in of the north wind, I should be in a position to navigate the unknown Upper Nile; and during the same season—I should hope to arrive at its extreme navigable point, where it would be necessary, in order to keep up my communications, to establish a station.

During the rainy season, if the course of the stream continued from the south, the prevailing south wind would prevent farther navigation during the inundation; but if it proceeded from the west or east—which latter I think probable—it might offer no impediment to the sailing of my boat, and I might continue my explorations.

Should the stream continue running from a northerly direction, the heavy rains would, I fear, prevent my following it by land until September or October, 1862; and it would probably require the whole of the ensuing dry season until February, 1863, to secure the object of the Expedition, when, God willing, the flood would bring me down the river to the cataracts of Gondokoro, and thence via Khartúm, home to England.

Such an expedition would involve boats on the White Nile from Khartúm to Gondokoro; one or two, probably a larger and a smaller one, on the Upper Nile above the cataracts of Gondokoro; and two establishments—one above the said cataracts, and the other at the extreme navigable point of the stream, in order to keep up my communications for all necessary supplies.

An undertaking to ensure the accomplishment of so glorious an object, if put before the nation under the influential and powerful patronage of the Royal Geographical Society, would, I would fain hope, be eventually carried out; and when it is considered that the proposed expedition might be effected with the double object of independent discovery and of rendering the assistance to Captains Speke and Grant, by supplying them with provisions and transport on their way down the Nile without any increased expense, I believe that in consigning the proposition to the able hands of your Lordship, the mystery that for ages has attached itself to the sources of the Nile is doomed to give way before the powerful influence and unflinching enterprise of Great Britain.

Having placed my opinions before your Lordship, I have the honour to subscribe myself

Your Lordship's most humble and obedient servant,

JOHN PETHERICK, F.R.G.S.

*The Right Hon. Lord Ashburton,
President of the Royal Geographical Society, etc.*

The CHAIRMAN said that he was sure they would all participate in the sentiments which Mr. Petherick had so forcibly, succinctly, and ably expressed. Every geographer who had turned his attention to the subject of the discovery of the Sources of the Nile, well knew the difficulties that would attend the explorations of Captains Speke and Grant, when they arrived at the north end of Lake Nyanza, and in reaching those portions of the Nile to which no traveller of any nation had as yet ever penetrated. It was in order to render assistance to these gallant men in this the most difficult portion of their journey, where they would have to pass through a country inhabited by hostile and dangerous tribes, that Mr. Petherick had offered his services. He was willing to abandon his other occupations and to give up his time to meet his fellow-countrymen in this region of the interior. He had only to repeat the expression of his admiration of the proposal, and he did most earnestly hope that British geographers would, by their subscriptions, support this noble enterprise.

The Papers read were :—

1. *Journey to Fort Simpson, Queen Charlotte Islands.* By Captain R. W. TORRENS.

Communicated by the DUKE OF NEWCASTLE, F.R.G.S., H. M. Secretary for the Colonies.

THE country through which the Nass River flows, like the whole north-west coast of British Columbia, is one long-continued formation of slate, with frequent veins of crystallized quartz. Immense mountains rise on either side, whose summits are covered with eternal snows, and under one of these our first camp upon the Nass was pitched.

From the third Indian village (8th day) upwards, the character of the country changes.

Evidences of volcanic action at some remote period are manifested in the blistered and discoloured appearance of the rocks; frequent veins of decomposed quartz occur, and bars of slateic boulders, covered with a slimy vegetation, supersede the shifting gravel bars of the lower river.

The miners agreed in saying that the geological formation of this district was as auriferous in indications as any they had ever seen, and they were very sanguine of results.

At 110 miles from Fort Simpson we came to a point where the river takes a rectangular turn, falling at the rate of from 10 to 12 feet per mile. Its waters are hurled furiously through the cañon, forming below the angle a whirlpool some 300 feet in circumference. Upon its outer edge, and at intervals of a few moments, the waters boil up from beneath as from a cauldron, raising the level of the current several feet, and then bursting with a fury that carries everything before it.

By dint of hard labour, as well as watching our opportunity, we managed to reach a counter-current which brought us into safety. The miners affirmed that "Fraser River" has no danger equal to this, and thankful were we all when it had been overcome.

Beyond this point we proceeded for 3 miles, when we were brought to a standstill by a waterfall, over which our canoe could not be carried. We therefore determined to go back to one of our previous prospecting places, and there await the fall of the river.

The country through which we travelled claims no attraction for settlement, although patches of open lands occur upon the plateau that once formed the bed of the river—some 50, some 100 acres in extent—which will prove serviceable for the production of vegetables in the event of an immigration taking place thither. Eighty miles from the mouth of the river the Indians plant large crops of potatoes, and thereby a depôt is formed, from which it would not be difficult to extend the cultivation of one of the greatest essentials in the economy of a mining camp.

In this northern latitude the climate is so severe as to render it doubtful whether cereals would mature. The transport of provisions might be made easy, for the trails throughout the country are already good.

It is not improbable, moreover, that the waters of the Nass may prove to be an easy and desirable medium of communication with the interior.

ABSTRACT OF JOURNAL.

Actual.	Running.	Distance.	Weather.	Date.	REMARKS.
1	1	30	fair	18 Sep.	Leave Fort Simpson with 3 of my original party and 2 Canadians (Alexander and Vantrín)—run 30 miles.
2	1	10	rain	19 "	Pass Observatory Inlet—Nass Straits about 12 miles broad. Camp 7 miles from entrance to river.
3	"	"	rain	20 "	Remain in camp—a regular deluge.
4	1	25	fair	21 "	9 A.M. enter Nass River—11 A.M. pass old Hudson Bay Company's Fort and Str. Anchorage—pass Shallows. Camp 2 miles below 1st Indian village.
5	1	12	fair	22 "	Pass 2nd Indian villages close to each other, above which tide rises for 3 miles. Stream gets strong—exchange paddles for poles—elevation of watershed of river becomes perceptible.
6	"	"	rain	23 "	Remain in camp.
7	1	8	fair	24 "	Elevation of watershed gradually increases—ditto strength of stream—gravel banks commence—prospect "colors" on bars.
8	1	10	fair	25 "	8 A.M. reach 3rd Indian village—river bifurcates—bad rapids—make portage—Indians kind—help to unload and reload—they wish us to remain—we decline—continue journey, camping 2 miles below 4th Indian village.
9	1	2	fair	26 "	At daybreak canoe comes from village from chiefs—they send to say they are glad of the arrival of the "white men"—they insist on our remaining 1 day in their camp—at 7 we arrive at village—the whole tribe turn out to meet us—they escort us to a house prepared for us. They then get wood and water for us, and make us presents of salmon and potatoes. They tell us of their old tradition. These Indians are the best we have seen.
	7	97			

ABSTRACT OF JOURNAL—continued.

Actual.	Running.	Distance.	Weather.	Date.	REMARKS.
10	7 1	97 10	fair	27 Sep.	Start early—4 miles beyond village the river takes a sudden bend, as if returning towards coast, and half a mile farther resumes its original course as it debouches from a slateic cañon in which we discover quantities of decomposed quartz. This cañon is about 3 miles long—the transit is difficult—prospects 2 cents to "pan"—camp or bar between cañons—one mile of open.
11	1	6	fair	28 "	Enter 2nd cañon—day's work hard—have to climb over rocks to drag canoe along—fall of river from 8 to 10 feet per mile.
12	.	.	rain	29 "	Camp on tributary of Nass—prospect "colors" on the banks.
13	1	3	fair	30 "	Push on in hope of getting through cañon—pass a fearful whirlpool, and are stopped by waterfalls rendering passage by canoes impossible—land trails good. As we cannot proceed, we determine to wait fall of river upon some bar previously prospected—return to camp.
	10	116			
14	1	11	fair	1 Oct.	Return to 1st cañon to a place where outline of a large bar (under water) appears 20 feet from river—sink pits in gravel banks which prospect well—only 2 feet of bar out of water, prospects on which are good.
15	.	.	fair	2 "	Sunday—no work done—water falling.
16	.	.	fair	3 "	Prepare rocker and prospect. "Tchaik" Nass chief visits us—his men all armed—Indians glad to see white men—exchange presents.
17	.	.	rain	4 "	Rock 100 buckets—get about 1·00 dollars—rocker in bad order—our quicksilver is reported to be poor.
18	.	.	rain	5 "	Our Indians procure a light canoe and go up river with 2 of the party—we are most anxious to ascertain if cañon is broken above, feeling confident from the auriferous indications of the country that in an open district above rich prospects would be discovered.
19	.	.	snow	6 "	Snow and frost—copper proves useless—roast it to work out verdigris.
20	.	.	snow	7 "	Ditto wash 200 buckets—get about 2·50 dollars.
21	.	.	fair	8 "	Wash 400 buckets—get about 4·50 dollars. Our Indians return with light canoe. The party went 10 miles higher up than we did—5 miles by water, 5 by trail—prospecting wherever they could. They only took a pan with them—they saved 1 or 2 of their prospects—the gold in which seems somewhat larger than our bar. Could learn nothing as to length of cañon—they came to a new tribe of Indians speaking French after a fashion—these Indians were good.
22	1	35	fair	9 "	Start for Fort Simpson.
23	1	6	rain	10 "	Blowing half a gale of wind—start from our camp (1 mile below 1st Indian village), crossing the reach opposite Old Fort, took in a reef by doubling and lowering our sail—heavy seas—canoe half full of water—make for land opposite Old Fort.
24	.	.	rain	11 "	Heavy thunderstorm and gale.
25	.	.	rain	12 "	Drowned out—shift our camp.
26	.	.	fair	13 "	Wind dead ahead during the day, everything prepared for a start—at 11 P.M. wind changes—the moon being clear we start at 1 A.M. (14th) on our journey—blowing very fresh 5 A.M. (14th) a perfect deluge of rain sets in, and continues all day. At 6 P.M. reach Fort Simpson—report myself at Fort—am invited to become a guest—Captain McNeill's hospitality and kindness to myself and my party I shall never forget.
27	1	64	rain	14 "	
	4	116			

The second Paper read was—

2. *Latest Explorations in British North America.* By Captain J. PALLISER, F.R.G.S., with Dr. HECTOR, and Mr. SULLIVAN.

[Captain Palliser's Paper will be published in the Journal.]

Dr. Hector to Sir Roderick I. Murchison.

Fort Vancouver, Dec. 18th, 1859.

DEAR SIR RODERICK,—I arrived too late at Fort Colville for any account of my explorations being communicated in Palliser's

despatches from that place in the end of October. I am sorry to say that I failed in my attempt to find a pass directly from the Saskatchewan Plains to the valley of Thompson River, the route I suggested to you as best in a previous letter. This failure, however, was not owing to any insuperable rocky barriers, but merely to my having encountered a forest growth so dense and so encumbered with fallen timber that I had neither men, time, nor provisions to cope with it. As it was, the escape from this region of the mountains was so tedious that we were nearly caught in the snows of the early mountain-winter; and at one time I thought I should have to abandon most, if not all, of our horses. However, I managed to bring them all to Colville, without the loss of an animal, by the end of October. I am, of course, not prepared to state that it is possible to run a road through the mountains in the direction I have indicated, but, from what I have seen of the mountains in the neighbourhood of the 52nd parallel of latitude, I hardly think the difficulties to be encountered would be much greater than those of any route farther south and yet north of the 49th parallel. However, until something is known of the country about the head of Thompson River, no opinion can be formed on this point.

I had to diverge to the south, when I found I could not get through, and striking the Columbia River in lat. $51^{\circ} 30' N.$, about 60 miles above the boat encampment, followed it up to its source in lat. $50^{\circ} 7' N.$, where it originates in two lakes. From its source to the boat encampment, the Columbia flows to the north-west, in a valley from 4 to 6 miles in width, the bottom of which is occupied by immense flats, swamps, and lakes, through which the river flows as a great canal, bounded by natural levées. Its current is sluggish as low as the mouth of Blueberry River, where I struck it, and from this point, if it were ever necessary, it could be with ease navigated to its source.

The country to the west of the Rocky Mountains is very much broken, consisting of ancient schist and granite bosses. It is on the western limit of this range of country, where the basalts which mark the region of the Cascade range commence, that the Pandoreille and Chi-milk-i-mean gold-mines are situated: the first on a tributary of the Columbia from the east and about half a mile north of the boundary-line, and the latter from a stream from the Cascade range and somewhere about the 49th parallel. The latter mines are very rich, but of limited extent; the gold is in large flakes, the average size being like herring-scales. I saw one piece worth 25 dollars.

The season was too late to cross the Cascade range from Colville to Fort Langley, so that we were obliged to follow down the Columbia to this place. Our horses gave out on the way, and we had to take to little dug-out canoes, and descend the river for a long way with considerable labour and risk. We have been very much hampered for ways and means, but some of the gentlemen of the Hudson Bay Company have kindly relieved us from this awkward position on their own responsibility.

The country here is in a state of complete collapse: a state of reaction from the undue excitement of the last few years. They say, however, that Victoria is very lively, its vitality arising from the capital held by the settlers there,—an item quite wanting among the immigrants to remote parts of the United States.

We have been received with great kindness by General Harney and the other officers of the American army at the posts we have visited. They are still pretty stiff-necked about the St. Juan affair, but a great deal of the excitement has evaporated. The troops returned here a few days ago, leaving only one company on the disputed island. All impartial persons on either side seem to admit the extreme nicety of the question, and those that have known the country longest, such as the officers of the Hudson Bay Company, seem to be unanimous in hoping that our Government will hold to our interpretation of the treaty, as on the coast it has always been considered as the correct one.

When we took to the canoes, we had to leave our instruments and papers, and I am obliged to wait here till they overtake me. Palliser has gone on to Vancouver Island to raise money to allow Sullivan to go home at once. He will wait for me there, and when I arrive we shall return to England, *viâ* Panama, at once.

I hardly think my report can be forwarded by this mail, as I doubt if it can reach Palliser in time, as he has been ice-bound at Portland.

Notwithstanding my best endeavours, I have a very poor show of fossils from the mountain strata this year. I have a good collection, however, from the coal-bearing strata of the plains. I would like very much to have an opportunity of seeing the coal strata of Vancouver Island, as I expect that they are all of one age, and all older than tertiaries. However, a short conversation with you, when I have the honour of meeting you again in the course of a few months, will, I am sure, throw more light on this and other matters than anything I can write.

I discovered a second glacier at the head of the north branch of

the Saskatchewan and issuing from Mount Murchison, which much exceeds in size the one I described last year, and which I took the liberty of naming after you along with its parent.

Hoping to have soon the pleasure of seeing you again,

I remain ever your most obedient servant,

JAMES HECTOR.

P.S. I enclose a map of this territory, which I received from General Harney.

The CHAIRMAN said they could not have heard the statement of Captain Palliser without being aware that he was exactly the sort of man to lead a party through such a difficult region. The Duke of Wellington had left it upon record as a first principle, that in order to advance through a country with troops you must supply them well with food; and they had only to hear with what animation Captain Palliser spoke of the destruction he made among the buffalo herds to feel satisfied that he had given every care to the Commissariat department. He was accompanied by men of science, upon whom devolved the duty of making those detailed astronomical and geographical observations which were the great object of the expedition. When all the materials were laid before the public, they would be found replete with the most valuable results. The astronomical positions were fixed by Mr. Sullivan; the magnetic observations by Lieut. Blakiston, and Dr. Hector acted as the naturalist and geologist to the expedition. Dr. Hector ascended some of the highest mountains, and as he was present he had to ask him two or three questions. First—What was the extent of land in the great region of the Saskatchewan, lying to the east of the Rocky Mountains, which was capable of being colonised? Secondly—The means of access into this region? and, Thirdly—What were the probabilities of rendering intercourse at some future time easy and practicable between British Columbia and this great region?

Dr. HECTOR, in answer to the first question, said the whole amount of country drained by the Saskatchewan and the Red River was about 155,000 square miles. Of this, about 80,000 square miles might be accounted of no value at all, except that it might perhaps be used for the purposes of grazing, if the remainder of the district were well settled up to it. This unfertile country embraced the elbow of the Saskatchewan, the Q'Appelle River, down to the boundary. Then there was a strip about forty miles in width at the base of the Rocky Mountains, which again became fertile. The remaining 65,000 square miles was a portion of country lying along the north branch of the Saskatchewan. It commenced at Carlton, and, stretching towards the mountains, extended to about 52° N. The line of it was not very regular, and probably it was an isothermal line. The belt of country lying south of the north branch of the Saskatchewan, and north of the 52nd parallel, swept to the south-east, and was of exactly the same character, as regarded vegetation, as was found in the Red River Settlement. Of these 65,000 square miles, there was not above one-third which was suitable for the immediate purposes of agriculture, and the cultivation of that one-third could be entered upon at once with success, as it would not require the clearing necessary in Canada and elsewhere. The distribution of good and bad country through the Saskatchewan district was, in a great measure, determined by the geological features of the country. There was a great ridge apparently to the east of the district, which travelled in a more or less connected manner, passing to the West of Carlton, crossing the Saskatchewan at the Eagle Hills, and extending a little above the elbow of the south branch, giving rise to the idea of two

isolated hills. That ridge extended to the south of Côte de Prairie, and its southern side formed the well-known Council Bluffs at Mandau Fort. It was really not a ridge, but the edge of an immense plateau of high country which stretched to the west, and formed the watershed between the rivers that flowed into the Gulf of Mexico and those that flowed into the Arctic Ocean by Lake Winnipeg; so that this transverse watershed of the continent was hardly anything more than a group of soft, hardly consolidated strata, which had been left uneroded during the time the immense valleys north and south of it had been scooped out. The whole of the country composing this high plateau was, from the nature of the strata, unfertile. The soil arising from the decomposition of this was highly charged with sulphate of lime and sulphate of soda, and most of the lakes were salt from the amount of saline matter with which the soil was impregnated.

With regard to the means of access, at present the Hudson Bay Company, who were in possession, brought their heavy goods into the country by way of Hudson Bay. It was a very difficult route, and he believed the Company were thinking of giving it up, and instead bringing their goods overland through the United States by way of Red River. This was a very practical method of entering the country. With respect to another means of access, or that by which the exploring party was sent, very little could be said in favour of it at present. It was a curious belt of country, and, geologically considered, was all mountain range, very much interrupted by watercourses. It had been carefully examined by the Canadian Survey, and the result was found to involve six changes in the mode of transit between Lake Superior and Red River. If thought necessary, it would be possible to enter the country by that means, and even to lay a railroad down, but the outlay would be enormous.

The journey he made, to which Captain Palliser had referred, was a trip he took in 1857, when he went almost up to the mountains with dogs. He started from Edmonton House, struck the head-waters of the Mackenzie River, and followed it up to Jasper House. His provisions ran out, and he was obliged to send his dogs back. He went on into the mountains, and got to within thirty or forty miles of his track of the preceding summer in the neighbourhood of Mount Murchison. He then returned through the woods by Lake St. Ann to Edmonton. The first trip he made into the mountains he left Captain Palliser at Slaughter Camp, and made his way up Bow River to Vermilion Pass. There were several passes reported, and he chose Vermilion Pass because it looked the best. It should be remarked that all these passes—the Vermilion Pass, the Kananaski Pass, and the Kutanie Pass—only carried you through the Rocky Mountains. The Rocky Mountains Proper, the great watershed of the continent, was really the eastern flank of an immense tract of mountainous country. They were of no great altitude until you reached the Cascade Range, which ran like a wall along the coast, broken by a few nicks—the Fraser River nick and the Columbia River nick. Between the Cascade Range and the Rocky Mountains, there was a mass of country still to be examined, and when it was examined he believed the passes would be found to continue on. The question had still to be determined whether there was a horse-track. As far as had been ascertained at present, there was no horse-track, owing to the quantity of snow which accumulated in the passes.

DR. JOHN RAE, M.D., F.R.G.S., was delighted to hear that Captain Palliser and his associates had carried out their surveys with such success, and with so little loss in a difficult country. He was glad on another account, because he found, by reference to old charts of the passes used by the Hudson Bay Company for a great many years past, and of which he knew there were charts put into the hands of people some twenty-five or thirty years before, that the observations made by the Company's agents were nearly correct. He believed most of the passes had been traversed previously by Hudson Bay people, but

this did not at all detract from the high credit due to these gentlemen, who had confirmed the correctness of previous observations, and had added the very valuable observations they had themselves made. At the time these passes were first used by the Hudson Bay Company and the North-West Company, there was not that interest in them that there is now, and there was no object in view further than to carry the Company's goods from one part of the country to another. But the Company had never withheld their observations from any person who came with authority to ask for them.

There was one point in which Captain Palliser had made a slight mistake. He said he saved eight days by going by a steamer through Lake Superior. Now, the usual time occupied by canoes going from Fort William along the coast was five days. Sir George Simpson went in four or five days.

The stoppage of supplies at Fort Colville did not arise from the Company. He was at Red River at the time, and much regret was expressed that they were stopped. The order did not come from the Company, but from a higher authority. The pass in our own territory was practicable, but it was rough and not advisable, if a more favourable one could be had, which does exist in American territory. He hoped the passes would not be opened out, as it would only lead to a great waste of capital. There was no difficulty in colonising the country; but where was the market for the produce? The cost of transport was so heavy that the grain could never be carried into the States to compete with American produce. The only thing that could support the country was the trade of the Hudson Bay Company, and when that was gone, the Red River Settlement must go too, or the country must be gradually settled up from the States.

MR. JOHN BALL, F.R.G.S., observed that, as he had taken some share in the arrangements for the expedition when at the Colonial Office, he felt the greatest gratification at the general success which had attended the efforts of Captain Palliser and his companions. Not that all the expectations originally entertained had been fulfilled, because the case was otherwise; but that the public mind had been disabused of some errors, particularly the notion of the colonisation of the southern valley of the Saskatchewan. Much future exertion and waste of capital would be saved, and it would be due to this expedition. One statement made by Dr. Rae he had heard with great surprise, viz., that the Hudson Bay Company—considering the position they occupied with reference to the Government, the Legislature, and the Public, as trustees for the British nation in that great continent—should not have communicated the information they possessed respecting these passes. It was an act of simple justice on their part to give freely any information they possessed, so that the lives and labours of Britons might be saved, and not thrown away on useless efforts. The conclusion to which his mind tended at present was that neither England nor America would be able to claim exclusive right over the route which would ultimately be the high road from England to China. He believed the route would lie alternately north and south of the boundary line; that at the eastern end, from Lake Superior to Red River, the route would lie north of the forty-ninth parallel and along the northern branch of the Saskatchewan; that it would then go southward into American territory, and continue on American territory until, somewhere in the direction of Fort Shepherd, the route again entered British territory.

MR. COLVILLE, a Director of the Hudson Bay Company, said he was not aware that the Company had ever withheld any geographical information from anybody who applied for it. He believed the whole of the information they possessed had been from time to time given to Mr. Arrowsmith, and that were it not for the maps and plans prepared by that gentleman, Captain Palliser would have had great difficulty in getting through the country. Indeed, he thought they had heard sufficient from Captain Palliser to satisfy them that the Hudson Bay Company had no wish to withhold either aid or information.

Both were most willingly given, in accordance with instructions sent by the Company by circular letter to the officers in charge of every station in the country. They had no plans and charts which they were not willing to publish, and which he believed were not already published. He might state that there was one pass which Captain Palliser and his party had not noticed. He had himself gone twice over the Rocky Mountains: the first time by a pass along the Peace River down to the head-waters of the Red River; and when he came back from Fort Vancouver he ascended Columbia River and crossed by the Athabasca portage. He slept on the top of fourteen feet of snow in the month of April.

The CHAIRMAN, in closing the discussion, said they had certainly always heard that the Company had more or less kept their maps to themselves.

MR. ARROWSMITH.—Not at all.

The CHAIRMAN.—Mr. Arrowsmith says "No," and he was sure, if all the knowledge they possessed of the geographical features of the country had been communicated to Mr. Arrowsmith, that that gentleman would have placed it before the world. There was a Dr. Thomson who had executed some remarkable maps of the country; and Mr. Ellice, a leading member of the Hudson Bay Company, had promised, if it were possible, that those maps should be brought to this country. He understood they were not attainable at once; but if they were, and the names applied by Dr. Thomson were to be realised, he had to announce that the mountain which had been named by Dr. Hector—"Mount Murchison"—would be converted into the "Devil Peak," *etc.* This came from geographical discoveries not being made public more rapidly.

ADDITIONAL NOTICES.

1. *On a Possible Passage to the North Pole.* By THOMAS HOPKINS, M.B.M.S.

AMONG the various attempts that have been made to approach the North Pole, that of Captain Parry may be considered as the most successful. It appears that he arrived at the latitude of $82^{\circ} 43' 32''$, the point nearest to the Pole that has been visited by man, of which we have any knowledge. And it seems to be considered that there is but little probability of a more northern part being reached by the employment of any means at present known.

The difficulties encountered by Parry were certainly formidable, and there is not much likelihood of greater spirit or perseverance being displayed by future explorers than was exhibited by him and his companions. Yet it may be desirable that the nature of the impediments that were met with should be examined, in order to form an opinion respecting the possibility of future navigators being more successful than their predecessors. The climatic features of that part of the world in which the effort was made are so extraordinary as to leave room to doubt whether past experience in other parts, in high northern latitudes, presents the means of forming decided opinions respecting what kind of weather may be found adjacent to the longitudes visited by Parry. The facts which he furnishes deserve close examination and careful analysis, in order to ascertain whether they present to view obstacles that must be deemed insurmountable, and, if not, what are the best means to be used in making a new attempt to overcome them?

A general view of the temperature of the atmosphere in this part may be

had already experienced, in the course of this summer, more rain than during the whole of seven previous summers taken together, although passed in latitudes from 7° to 15° lower than this! We were now in latitude $81^{\circ} 23'$ and in longitude $21^{\circ} 32' 34''$ E. We now enjoyed the first sunshine since our entering the ice. On the 2nd July the weather was calm. The temperature at noon was 35° in the shade and 47° in the sun. The weather became gradually inclement, and thick with snow and sleet. The snow-storm changed to heavy rain, and the wind increased to a fresh gale. We halted at 6 on the 8th, in time to avoid a deal of rain. On the 9th we enjoyed the indescribable comfort of two or three hours' clear dry weather, but at 5 A.M. it again came on to rain, which continued most of the day, but was succeeded by one of the thickest fogs I ever saw. There was not much dryness in the atmosphere when the sky was clear, the dew-point by Daniel's hygrometer being 35° at noon, when the temperature of the atmosphere was the same. Lat. $82^{\circ} 14' 28''$, long. $22^{\circ} 4' 1''$ E. The temperature of the surface-water was $32\frac{1}{2}^{\circ}$, the air being 36° . It rained hard and incessantly. I had never before seen any rain in the Polar regions to be compared with this, which continued without intermission for 21 hours; sometimes falling with great violence, and in large drops, especially about 2 A.M. on the 15th July. It held up a little at 5, and at 6 we set out, but the rain soon recommenced. At 8 the rain again became heavier, and at 10 we were obliged to halt, the rain coming down in torrents. The wind shifted to W.S.W. in the afternoon, and the rain was succeeded by a thick fog, after it had been falling for 30 hours out of the last 31. At midnight on the 22nd July, we had a good observation in lat. $82^{\circ} 43' 32''$; the long. $19^{\circ} 52' 1''$ E. The wind had been much from the south; on the 20th a north wind arose. The meridian over which we passed was found warmer and wetter than Phipps found it. It would probably have been no difficult matter to reach the parallel of 83° in our ships about the meridian of the Seven Islands."—p. 256.

In this laborious effort to approach the Pole nothing appears to have surprised the adventurous voyagers so much as the large quantity of rain that continued to fall. But there is good reason for presuming that to this rain they might have attributed the degree of warmth which they experienced. Moist air, coming from the south, would soon have some of its vapour condensed by the cold of the latitude; and this condensation being continued by successive supplies of southern vapours, would produce ascending atmospheric currents and rain, of a temperature that would be determined by the quantity of heat given out in the lower regions by the condensing vapour. The rain would be the principal agent in thawing the ice that had been accumulated during the winter; the remaining portion of the ice, as it thawed, preventing the temperature of the sea from rising much above 32° . Supposing this view to be substantially correct, it will follow that, to the flow of much atmospheric vapour from the south, we have to attribute not only the comparatively high temperature of the locality, but also the thawing of the ice, and the opening of a navigable sea. The possibility, therefore, of penetrating farther into the Arctic Ocean, and approaching the Pole, appears to depend upon the continuance of an adequate supply of vapour from warmer latitudes.

In examining the lines on Dove's charts, in this part of the Arctic Ocean, we are struck with the advance of warmth at all times of the year, far towards the east as well as the north. It is sufficiently apparent that some cause takes atmospheric heat northward from, say about Iceland, towards the meridian of Nova Zembla. The central portion of this warm aerial current appears to pass somewhere between the North Cape and Spitzbergen, in about a north-eastern direction.

Supposing it to continue in the same course it would approach the Pole,

say between the meridians of 40° and 60° E. Towards this part moist south-west winds do actually pass freely from the Northern Atlantic; and it may be presumed, from what is known to take place in other parts of the world, that these winds produce the high temperature of the parts pointed out.

But some special cause must exist capable of determining the wind to blow towards this locality; and, in the absence of positive information on the subject, yet in accordance with what has been proved to take place in many parts, we may infer that this cause is the existence of an elevated ridge of land near to the Pole! In every part of the world, where winds blow with a certain degree of permanence, it has been shown that there is elevated land at their termini, against which land atmospheric vapour is condensed, producing in the parts ascending currents. These currents are generally constituted of air which has been brought from a distance over the sea; and the Arctic Ocean between the most northern part of the continent of Europe and the islands of Iceland and Spitzbergen is the part over which air would be likely to pass to such high lands. The mountains of Spitzbergen rise to a height of from 3000 to 4000 feet, and those of Nova Zembla are represented to be of about the same height. The latter appear to be a continuation of the Ural Mountains, which are near the meridian of 60° E. The south-west winds of these parts furnish presumptive evidence that land exists farther north; as no other reasonable cause of these winds can be found, and analogy warrants the inference that high land, in the locality pointed out, is the cause. It may be an extension of that which rises so much above the ocean level in Nova Zembla, or it may be a continuation of North-East Cape. Lines of elevation are generally continuous, and though they may sink below the ocean in one place, they may, at a considerable distance, rise above it, to a sufficient height to condense vapour that is brought in a moist atmosphere. Such elevated land may, therefore, through the agency of condensing vapour, be presumed to be the cause of the superior warmth that is found penetrating far into the Arctic regions in this part of the world.

We presume then that condensation of aqueous vapour is the cause of the summer temperature in this part being higher than it is in other parts of the Arctic Ocean of the same latitudes; as then the liberated heat of vapour is added to the direct solar heat to constitute the actual temperature. The sun remains above the horizon in that season, but it does not ascend higher in the heavens, and therefore the direct heat is not powerful to raise the temperature. The accumulated ice of winter, when converted into water in the summer, absorbs much heat, and makes it latent—tending to keep the temperature from rising above 32° . It requires, therefore, the heat of vapour to be added to the direct solar heat to warm the part to the extent that is experienced.

A continuous supply of vapour is, however, necessary to produce the prevalent wind; but that wind may not only contribute towards the melting of the ice, and making an open sea, but may materially assist navigators in making their way towards the supposed high land, and possibly to the Pole. The Russians are, no doubt, in possession of much information respecting the summer temperature, near the North-East Cape, in latitude 78° , but I am not aware of its nature. The prevailing land-winds in this part, both in winter and summer, are said to blow from the Polar Sea over the land of Eastern Europe, and the air in them may be supplied from an ascending current in the neighbourhood of the Pole. Large portions of the atmosphere seem to pass over the Northern Atlantic and Arctic Oceans to high northern latitudes, and towards the longitude 60° E., from which they appear to return to the great areas of condensation that are situated southward, thus forming parts of a system of aerial circulation, which, with some irregularity, passes over Europe towards the West Indies, and returns by the Atlantic to

Of the island of Nova Zembla we have but few accounts from recent voyagers. Barentz visited it, and from what he says it may be presumed to resemble Spitzbergen in the warmth of its summer climate.

When Captain Parry left Spitzbergen he proceeded directly northward; and we have seen that he encountered much rain, with occasionally a high temperature for the latitude. It seems also that he might have proceeded farther on the same meridian, notwithstanding the obstacles to his progress presented by the ice, had he not encountered an adverse oceanic current. This current is described by him as setting southward, that is, it was running from the Pole! Now a current of water could not flow from the part about the Pole, along the meridian of 20° E., on which Parry was proceeding, unless some other current was running towards the Pole, over some other meridian. It has been shown that in all primary currents of the ocean, wind presses on the surface of the water, and forces it forward until it is stopped by some barrier. The water is then raised above its natural level, and may possibly return as a secondary current passing through some channel, or as an under-current; or, the water, having been forced forward in an open sea in one direction, may meet with another current and be bent from its course, as is found to be the case in many parts of the ocean. The current encountered by Parry, when he was near the latitude of 83° , may therefore have been a return current flowing from the Pole.

Malte-Brun says, "The polar currents of the north exhibit very remarkable effects. These currents are particularly observed in the Northern Frozen Ocean, on the coasts of Greenland and Iceland, and in Bering Strait, they have usually a direction from north to south, occasionally the reverse. In Bering Strait the current which brings the ice from the Polar Sea to the neighbourhood of Kamschatka is distinctly felt" (p. 341). Now it is not possible that water could continue to flow from the Northern Frozen Ocean unless some other current flowed into it. And the various facts within our knowledge, some of which have been given, point towards the part named as the line or stripe which this current traverses in flowing towards the Pole. An oceanic as well as an atmospheric current passing over the Arctic Ocean from the south-west, near Nova Zembla, might go eastward across the Polar Sea, and to that part of it which is north of America. Or the water having been forced towards and accumulated near to, or about the supposed high land near the Pole, might, by statical pressure, be afterwards impelled towards Bering Strait, Barrow Strait, and even to the east coast of Greenland; just as the water in the Gulf of Mexico, by its elevation, forces the rapid Gulf-stream through the Straits of Florida to the Azores. The existence of a current flowing from the north through Bering Strait, and another from Baffin Bay to the Atlantic, raises a presumption that there is a stream from the south forced into some part of the Arctic Ocean; and in no other part does it appear so likely to be found as between the islands of Spitzbergen and Nova Zembla. Supposing this sea to be open in the summer, it would not require a strong southern current to furnish the water that may pass by the Pole and out by Bering Strait and Baffin Bay, seeing that neither of the two latter is strong, and that, on the east side of Greenland, it appears to be so feeble as to be detected only by the presence of bodies that have floated to its shores. Malte-Brun attributes the currents from the north to the melting of snow and ice; but this is so inadequate a cause, that it perhaps would not have been thought of, if any other probable cause could be found.

Dr. Kane, in his account of his northern voyage on the western side of Greenland, represents that his exploration was continued up to the 12th July, and he observes that "Greenland has been traced to its northern face. A glacier runs nearly due north, and cements together the continent masses of Greenland and America. The northern land into which this glacier merges

has been named Washington; and the bay which interposes between it and Greenland I have named after Mr. Peabody. This bay gives exit at its western curve (latitude $80^{\circ} 12'$) to a large channel. This channel expands to the northward into an open and iceless area, abounding in animal life, and presenting every character of an *open Polar Sea*. A surface of 3000 square miles was seen at various elevations, free from ice, with a northern horizon equally free. A north wind, 52 hours in duration, failed to bring any drift into this area!—*Kane's Official Report*.

Captain Parry, when near latitude 83° , discovered that a current of water setting to the south was strong enough to prevent his proceeding farther towards the north, and defeated the main object of his voyage. Now the water thus found, we have seen reason to believe, may have been a return current of water, which had previously been forced above its natural level by a wind blowing over some other meridian from the south. The part near Nova Zembla, already described, is the only one where such a wind is found; in that part, therefore, it may be presumed that a southern oceanic current exists.

It may be thought that the evidence which has been brought forward is not sufficient to warrant the belief that such a stream as that alluded to, flowing from the south, is in existence; but candid inquirers will admit that analogy gives strong countenance to the belief. Over every part of the ocean, where a decided wind blows, it puts in motion the water, and produces a current proportioned to the strength and continuance of the wind. The great permanent trade-winds create oceanic currents, as do also the monsoons or season-winds during their period of action. Tropical west winds blow towards the great East Indian Archipelago, the coasts of Guinea and Panama, and western oceanic currents attend them. When winds blow over the ocean a current of water is always found to follow them, of a strength proportioned to the strength of the wind, and the constancy of this association is evidence of the connexion that exists between them. In the Northern Atlantic wind blows from the south-west into the Arctic Ocean, and water goes with it, as far as has been traced, from warmer to cooler latitudes. In the southern hemisphere a wind blows from Victoria Land across the Southern Ocean, to Tierra del Fuego, and it creates a current sufficiently strong to impel water towards the Western American coast, which, when helped forward by another wind, takes it near to the Equator. On the eastern side of South America, along the coast of Brazil, a current runs from about the 8th to the 50th degree of south latitude, and this is in the opposite direction to the current that is found on the western side; but both are put in motion by winds. Analogy therefore authorises us to believe that the south-west winds, which prevail between Iceland and Norway, and which blow in the Arctic Ocean between Spitzbergen and Nova Zembla, take with them a current of warm water; and we may infer that the water and the warm moist air will have influence on the climate and general state of the Arctic Ocean.

We may then draw the general conclusion, that to the east of Spitzbergen there probably is, in the summer of the northern hemisphere, an open sea extending towards the North Pole, which may possibly be navigated by a ship that has been properly prepared for the voyage. The particular line over which the prevalent southern wind generally passes in the summer, may be ascertained from persons the most capable of giving information on the subject; and along the line navigators might proceed towards the Pole at the proper season. The kind of ship best suited for the purpose would, of course, be determined by those most competent to decide on the point, but it is to be presumed that steam would be used to propel it.

From the latitude of 83° , which has been already approached, to the Pole, is only 7° , or 420 miles; and if no serious obstruction were encountered, this

distance might be passed over in a very few days. Floating ice seems to be the impediment most likely to be met with, but a screw-propelled ship might be able to make way through it, without much danger of sustaining damage, and in this way the Pole might possibly be reached.

Persons familiar with Arctic navigation would have the benefit of local knowledge, though possibly such knowledge may hardly justify such an attempt. This paper has been suggested by observations of continuous winds in many parts of the world, of their places of termination, and the climates of those places. The south-west monsoon, blowing towards the Himálaya Mountains, readily takes a ship into the Bay of Bengal, and the trade-winds waft vessels across both the Atlantic and Pacific Oceans. A wind blows from Victoria Land, in the Antarctic Ocean, to the mountains about Cape Horn, which are warm in the winter, evidently because vapour is condensed there in great abundance; and the wind is the strongest when it approaches the locality of condensation. If, as is very probable, there be similar elevated land near the North Pole, it is likely that a ship might reach that land with greater ease than when passing from Victoria Land to Cape Horn.

2. Surveys in Norway. By Professor HOLST, Christiania. Translated from the Norwegian by DR. SHAW.

In the Budget of the Norwegian Diet is found an article on the progress of the Geographical Survey of that country, from its beginning to the year 1859, accompanied by a review of the results attained; which statements will be of interest to many more than to those few into whose hands a copy of the Government's treatise may fall, and which therefore is communicated here.

The Survey was founded in the year 1779 by General Huth, Chief of the Danish and Norwegian Engineer and Artillery Corps, and in that year the officers appointed to the task, Lieuts. D. Vibe and Rick, after having received the necessary instructions, repaired to Norway. A base was measured during the winter on the ice of the Miös, on which the trigonometrical net was constructed, and later, on the ice of the Lakes of Førmund, Storsøe, and other lakes. Astronomical observations were likewise made by the above-mentioned officers. While these were employed from 1780 to 1790 on the survey of the kingdom, especially along the frontier districts, it was resolved that a Hydrographic Survey should, at the same time, be carried on, in order to obtain exact charts of the southern coasts. For this task Lieut. Growe of the Royal Navy and Lieuts. N. Vibe and Aubert were selected. This survey was commenced in 1788 and concluded in 1799. The result was 7 engraved charts of the tract between Drontheimsfjord and Idesfjord, with descriptions of the coast and of the country around. At that time the survey was placed under the Revenue Board of Denmark, and the King, as proprietor of Laurvig, in the year 1807 commanded that very special charts should be taken of this district also. Besides this, the surveys were continued in the districts of Drontheim and Hedemark and along the frontier of the kingdom, and executed on a large scale; it being thought necessary to have very special maps of those districts in which the contests between Norway and Sweden had generally taken place. The surveys were, however, often delayed, partly from want of means, especially during the last war. After the union of Norway with Sweden the task was placed under the Department of Finance, Commerce, and Customs, and afterwards under that of the Home Department. When, in 1826, so much of the east and south of the country had been specially measured, that maps of the districts could be made, Captains Munthe and Ramm undertook this task, as a *private* enterprise; and six maps, comprising the districts of

Akershuus, Smaalenees, Yarisberg, Laurvig, and Hedemark, were published in France. These copperplates have been since purchased by Government and placed under the Committee of Surveys. The above-mentioned maps were published between 1826 and 1832.

In 1841, when fresh materials were acquired, the Finance Department resolved to have the maps of the districts continued and published at the expense of Government, and Captain Gjessing of the Royal Artillery was charged with the execution; he has since finished eight maps, representing the districts of Christiania, Buskerud, and Bratsberg, and the northern part of Nedenæs, and Robygdelaget districts. The want of trustworthy charts of the coasts of Nordland and Finmark being felt, in 1828 an expedition was fitted out for the purpose of supplying this deficiency, and furnished with most excellent instruments. The foundation of this survey was laid by MM. Hagerup, Paludan, and Vibe, and the work was concluded in 1844; and the survey of the tract of coast from Drontheim to Jacob River, which forms the boundary towards Russia, was afterwards completed. During several years a small Astronomical Observatory had been established at Tromsø under the superintendence of M. Due. In 1832 Professor Hansteen and Major Vibe undertook a journey to Drontheim in order to verify by observations the triangulation founded on the earlier trigonometrical points, which extended over the regions of the northern coasts. Sufficient materials having been accumulated to publish charts of the coasts of Nordland and Finmark, Government entrusted Major Vibe with this enterprise, and from 1832 to 1848 he constructed ten special and two general charts with descriptions of the whole northern coast. The charts of the coasts were lithographed in Christiania.

Numerous measurements of heights have been also made, and, together with other observations by scientific travellers, collected by Vibe and published in Keilhaus' 'Gæa Norvegica.' A continuation, containing the measurement of heights taken during the past years, is in progress. In 1841, 1842, and 1844, an expedition was fitted out under the command of the present Postmaster-general, M. Motzfeldt, to sound and examine, in connection with the fisheries on the northern coasts, the often mentioned bank of the "Havbroen," "Sea-bridge." In 1835 a new line was measured on the ice of the Christiania fiord by Colonel Broch. It was put in communication with the Observatory, and with Kongsvinger, through which the first meridian of the kingdom is drawn. Later two great series of triangles were carried on to Drontheim and Bergen; the first in the years 1835 and 1836 by Colonel Broch, the latter in 1852 and 1853 by Captain F. Naser. On these series of triangles all later trigonometrical measures are founded.

In 1842 a connection with the Swedish triangulation was formed across Fredrikshald by Vibe; and in 1858 a similar one across Kongsvinger by Naser. In 1845 Struve, the Director of the Observatory at Pulkowa near St. Petersburg, applied to Government for the co-operation of Norway in a great measurement, which should comprise a meridional arc of more than 25° of latitude, viz., from Ismail on the Black Sea to the northern boundary of Finmark. Both Norway and Sweden were willing to conduce to this scientific end, and the guidance of the Norwegian portion of the work was undertaken by Professor Hansteen, and that of the Swedish by Professor Selander. In the years from 1836 to 1850 inclusive, this measurement of degrees was completed, as far as Norway was concerned. The operators were Lieut.-Colonels Klouman and Lundh, and the Swedish Doctor Lindhagen, at that time holding a place at the Observatory at Pulkowa. In 1854 at the northern extreme point of this meridional arc a monument was erected at Fuglenæs near Hammerfest. In order to attain a final determination concerning the measurements, Professor Hansteen met in 1853 in Stockholm both Struve and Selander, and, besides other preliminary writings on this subject, the two first folio volumes

of the following work were published in 1856 and 1857 : "Arc du Méridien de 25° 20' entre le Danube et la Mer Glaciale, mesuré depuis 1816 jusqu'en 1855, sous la direction du Comte de Tenner, Lieut.-Général de l'Etat Major Impérial de Russie ; Chr. Hansteen, Directeur du Département Géographique Royal de Norvège ; N. H. Selander, Directeur de l'Observatoire Royal de Stockholm ; F. G. W. Struve, Directeur de l'Observatoire Central Nicholas de Russie."

Christiania Observatory being the initial point of issue for the trigonometrical survey of the kingdom, the exact determination of its situation is of the very greatest importance. A chronometric expedition was undertaken by Professor Hansteen in 1847, between Christiania and Copenhagen, for the determination of the difference of longitude of these cities. The results of this expedition, furnished with twenty-one chronometers, which were carried twelve times forward and backward between the above mentioned cities, are given in the work by Hansteen and Fearnley, entitled 'Description and Situation of the University's Observatory at Christiania, 1849.'

However excellent the older charts of the coasts of southern Norway were, new ones, corresponding with the progress of science, were highly desirable ; and Major Vibe having been charged with their construction made five special and one general chart of the coast from the Swedish frontier to Christiansand, during 1851 to 1856. They are accompanied by descriptions of the coast and land. The work has since been carried on by Lieut. Schie of the Engineers, who in four charts has farther represented the coast towards the west, past Egersund. The two general maps of Northern Norway, by Professor Munch, were published by the Ordnance Office.

1. The triangulation extends over the dioceses of Christiania and Christiansand and over parts of Bergen and Drontheim, also over the coast of Nordland and Finmark. The number of signals erected, and other points, the position of which has been trigonometrically determined, amount to 3900.

2. Of drawn trigonometrical skeleton maps there are 270.

3. Manuscripts containing astronomical observations, trigonometrical tables, co-ordinate calculations, determinations of declination, hypsometrical and other measurements, soundings, descriptions, with many other manuscripts, amount to 550 volumes.

4. In detail are completely measured the dioceses of Christiania and Christiansand ; of the diocese of Bergen 140, and of that of Drontheim 110 geographical square miles. The whole of the measured area in south Norway may be estimated at 1070 Norwegian or about 2410 geographical square miles.

5. This detailed measurement is contained in about 2800 sketch-maps with appertaining special descriptions.

6. Besides the maps finished, large maps have likewise been drawn, each comprising about 25 Norwegian square miles. Thirty-eight such maps have then been made, comprising altogether 850 Norwegian, or about 1910 geographical square miles.

7. The coast has been hydrographically examined ; in the first place all along southern Norway, afterwards over Nordland and Finmark, and, again in the southern part of the kingdom, the tract from the Swedish boundary to Hardangerfjord.

8. The verified charts of the coasts and of the appearances of land already drawn amount to about 400, with descriptions in manuscript.

9. The number of measurements of heights amount at present to about 6500. Up to 1849, these have been published in the second and third volumes of the 'Gæa Norvegica,' and a complete collection up to 1859 is in hand.

10. The following printed maps and charts have left the press :—

A. *Maps*.—Munch, general map of Northern Norway, 2 sheets ; Munthe and Ramm, maps of districts, 6 sheets ; Gjessing, ditto, 8 sheets. B. *Coast Charts*,

with descriptions, &c.—Grove, N. Vibe, and Aubert, Southern Norway, 7 sheets; A. Vibe, ditto, 6 sheets; Schie, ditto, 4 sheets; A. Vibe, Northern Norway, 12 sheets. Total, 45 sheets.

11. Of the above mentioned later maps, and especially of the charts of the coast, many have been published in new and corrected editions. Altogether a number of 20,100 copies have been sold; viz., 3540 maps of districts, 1100 maps by Munch, and 15,460 charts of the coast; and in the office are still in store about 12,000 copies.

12. The fishing-banks and the "Sea-bridge" have been surveyed, and the manuscript records, accompanied by illustrating charts, are preserved in the archives of the office.

13. The measurement of degrees in Finmark is completed, and its results published.

14. The results of the chronometric expedition have likewise been published. During late years the office has received a very considerable collection of printed foreign charts, especially hydrographical. These have chiefly been presented by Government, or by the Geographical Societies of Sweden, Denmark, England, Russia, France, the United States of America, &c.

3. *The Federal Map of Switzerland.* Communicated by PROF. PAUL CHAIX of Geneva, Corresponding Member R.G.S.

THE origin of this great work is due to the triangulation of the western part of Switzerland, undertaken at the end of last century, by M. Tralles, of Berne, for the special purpose of determining systematic laws of refraction from the different altitudes of the mountain summits. About the same time M. Feer, the astronomer at Zürich, with the assistance of M. Pestalozzi, drew from a base line measured on the banks of the river Sihl, near Zürich, a series of triangles to the shores of the Lake of Constance; a great number of their signal stations have, however, been destroyed, and there are no means of finding their sites. In 1811 Professor Trechsel was commissioned by the Government of Berne to triangulate the southern part of that canton, resting upon the base measured at Aarberg by M. Tralles. This work was completed in 1816, and has been revised and embodied in the general triangulation of Switzerland. In 1822 a survey of part of the district of Sargans on the eastern frontier was made and submitted to the Federal Government, which was then deliberating upon the execution of the great topographical map of the Confederation. The work having been decided upon, its execution was entrusted to Quartermaster-general Finsler, who preserved the general management till 1828, when he was succeeded by General Würstenberg, who carried it on till 1833, being in his turn succeeded by Colonel, now General Dufour, by whom it is now being completed.

The map is designed on the scale of ~~reduced~~ of nature, constructed on Flamsteed's modified projection, and to be completed in twenty-five sheets, each sheet being seventy centimetres long and forty-eight centimetres broad, corresponding to an area of 70,000 metres by 48,000.

Two base lines were measured by M. Tralles, with the assistance of M. Hassle, of Aarau, one near Aarberg, and the other near Thoune; the former was measured twice, once in 1791 and again in 1797, both measurements giving a length of 40,188.5 French feet, and differing from each other by only one-fifth of a foot. In 1832 it was remeasured, owing to a difference of ~~300~~ being discovered between the sides of triangles connected with it from a short base measured by M. Feer, near Zürich; this difference was found to be due to

the standards employed. This last measurement, effected by means of tubular iron rods, which had been submitted to the closest examination and experiments with regard to their dilatation under various temperatures, gave a result of 13,053·74 metres or 40,185·208 French feet. The base measured by M. Feer in the Sihlfeld, near Zürich, having been reached by 14 triangles based on the new measure of the base at Aarberg, was calculated to be 3,360·256 metres, while an actual new measure gave 3,359·930. The connection of the triangulation with those of other countries offers a convincing proof of the accuracy of the Swiss measurements. The length of the side Roemel to Faur d'Enson was calculated by the French engineers as 35,997·22 metres, while the Swiss triangulation makes it 35,997·27 metres. The side Pizzo Forno to Pizzo Menone di Gino was found by the Austrian Staff to be 44,572·77 metres, and by the Swiss 44,572·12.

The number of primordial triangles is 110; 14 of the stations are more than 3000 metres above the level of the sea, 22 from 2500 to 3000, and 15 from 2000 to 2500 metres. The number of triangles of secondary order was 443 in 1840, but has been greatly increased since. With some of them it has been found impossible to observe the three angles owing to the inaccessible nature of one of them, and the consequent impossibility of establishing signals and stations on those points. Most of the highest summits in Switzerland are included in this class, thus giving a peculiar interest to the hypsometrical results of the secondary triangles.

The latitude of the Observatory at Berne, as determined in 1812 by MM. Henry and Delcros, of the French Geographical Engineers, and by Prof. Trechsel, by 382 observations of zenith distances of the Polar Star, was $46^{\circ} 57' 8\cdot63''$, but by a trigonometrical connection of Berne with Paris made by the French Engineers it was fixed at $46^{\circ} 57' 6\cdot02''$. The last has been adopted by MM. Dufour and Eschmann on account of its coincidence with the position arrived at from their comparison of the latitudes of Zürich and Geneva, as determined by MM. Eschmann and Alfred Gautier. For the same reason the longitude of Berne has been adopted as it was determined by the French triangulations, viz., $5^{\circ} 6' 10\cdot8''$ E. of Paris.

The heights above the level of the sea have been determined by a comparison of the Mt. Chasseral in the Jura, as given by the French measurement, and its altitude above the level of the base at Aarberg. Care has been taken not to attempt the measurement of inaccessible points except by comparison with other points placed in about the same circumstances. Angles and observations taken from points much inferior in height and placed at a short distance are of less value than those taken from more distant stations, as the summits being generally rounded at the top are more in evidence at the greater distance. Snowy crests are, besides, subjected to variations in height of perhaps seven metres, owing to the melting or evaporation of the snow. It will never be possible to determine exactly the height of Mont Blanc. According to the measurements of the Sardinian engineers from Mont Colombier, with the factor 0·078 for refraction, its altitude is 4799·70 metres, and from Mont Granier, with the factor 0·076, it is 4,804·03; by M. Puissant in the 'Nouvelle Description Géométrique de la France,' it is stated to be 4808·32. The Swiss measurements have given the following results: from the Moleson, with the factor 0·080, it is 4,801·9; from the Signal de Bougy, with the factor 0·075, it is 4,803·0; and from the same station, with the factor 0·080, it is 4797·8 metres. The very great attention paid to these observations may lead to a better knowledge of the laws of refraction and a better determination of the heights of mountains.

General Dufour has adopted a mixed method of representing the ground, viz., the vertical light with moderate proportions of shading for the relatively flat and undulating tracts, and the old system of oblique light under an angle

of 45° for the upper truly mountainous regions, where the former method would have made the map illegible. The slopes are represented in the original drawings by the projection of horizontal curves designed to have a difference of level of 10 and 30 metres, according to the scale of 1:100,000 or 1:150,000, from each other. These drawings are then given to the practical limners and engravers, who apply to their translation determined rules of shading.

The execution of this work has been attended by great difficulties, owing both to the nature of the country to be surveyed and the limited means placed at the disposal of the engineers by the Government. In 1832 lightning struck the tent of M. Buchwalder on the top of Mt. Sentis in Appenzell, killing Gobat his assistant, and disabling M. Buchwalder himself for the remainder of the campaign. More recently M. Landsmann was precipitated from a cliff in the Grisons and killed. M. Eschmann ascribes several errors in his measurements to the fact that the accuracy of the level he used might sometimes be altered by the neighbourhood of large mountain masses, and he thought that the freezing of the ground on which the instruments had been left during the night might have altered their position. The engineers are during the summer for months together engaged in conducting their operations at heights of many thousand feet above the level of the sea.

In many mountainous districts, where the engineers most required the assistance of the people to overcome physical difficulties of every kind, the ignorant inhabitants were so much averse to having their own country surveyed, that they at first destroyed the signal stations and scarcely allowed the engineers to proceed with their work. Some of the cantons have, however, been prevailed upon to have the survey of their districts made on a larger scale, so that the results have only to be reduced to the scale of 1:100,000 for the purposes of the map. In such case, when the canton has no private staff of its own, the work is executed by the Federal engineers, one-third of the expense being defrayed from the funds allowed to the Federal Survey and the remainder by the Cantonal Government.

4. *Sketch of Hilly Daghestan, with the Lesghi Tribes of the Eastern Chain of the Caucasus.* By BARON DE BODE.

Communicated by THOMAS HODGKIN, M.D., &c.

Read, March 26, 1860.

If you take up a map of the Caucasus, you will find that, bordering on the western shores of the Caspian, are the territories of the Shamál of Terki and the possessions of the Kazi-Kámúks and Mehti-Kúli tribes.* They all lie east of the highlands with which we have now to deal, which extend to the north of the great chain. Unlike the other alpine regions of the Caucasus, split into hill and dale, with spurs and offshoots from the principal snowy range, Daghestan† offers a singular aspect of stupendous granite masses, forming a high table-land, intersected by rapid streams, the three Kòi-sus,‡ with their respective tributaries, embedded in deep ravines whose steep walls descend terrace-like to the water's edge. The greater part of these granite hills are void of vegetation, and look wild and dreary.

Agriculture is in a most deplorable state. You may often see some hardy

* These districts lie between Derbend and the Terek. See Monteith's map of Georgia.—J. S.

† Daghestan has been generally considered as mountainous with very narrow valleys.—J. S.

‡ Turkish words—Kioi, a village. soo, water.—J. S.

mountaineer, with a few handfuls of wheat in a bag attached to his waist, a musket slung over his shoulder, and a dagger in his belt, climbing up some steep rock, by the aid of a crook and a rope, in quest of a patch of vegetable soil wherein to deposit the grain. Nor can the cattle find much to graze upon on those naked granite heights. The scanty grass that springs up early in the year is soon parched by the scorching sun of summer; and when winter sets in, the whole face of nature on this high table-land is covered with a uniform sheet of snow several feet in depth.

This peculiar sterility of nature has prompted the inhabitants to attend more particularly to the erection of terraced gardens, and it must cost them much labour and some degree of skill to lay them out on the brink of precipices. They also select the least accessible points to erect their dwellings, which, like eagles' nests, are seen perched against some craggy rocks. For want of space, their houses—all built of freestone—crowd one above the other, spreading at times in the form of an amphitheatre, with turrets, crenelled walls, and other means of defence, every village constituting a fortress in itself.

Roads there are none, and the narrow footpaths used by the mountaineers can scarcely be available for beasts of burden. This is not a very prepossessing picture of Daghestan, but such are the outlying and principal features of this land.

Nor are the moral features of the people less characteristic. Wild as the scenes that surround them, with an indomitable spirit and a passion for independence, the Lesghi are sober by necessity as well as by habit. There is a restless, lurking fierceness about the eyes which he can ill conceal, and which conveys a disagreeable expression to his whole physiognomy. In this respect the deportment of the Cherkess is nobler and far more prepossessing: there is a degree of open frankness which suits so well with his tall yet slender form. The Lesghi is more hidden in his movements, with something of the feline species in his nature. It is not unlikely that his political position, surrounded by enemies within and without, has much to do in developing these characteristics, as he is ever on the alert against surprise, while his own predatory habits teach him caution and dissimulation. Comparing him with the *Lek* tribes of the highlands of Persia, I am also inclined to give the preference to the latter as to external appearance. He may be more swarthy and decidedly blacker than the highlander of Daghestan, but he has a more ruddy complexion; the Lesghi looks sallow and careworn. I do not recollect to have met with any blue eyes among them, although in general their hair appears of a lighter colour than that of their Persian or Cherkess neighbours. And may not this peculiarity be accounted for by the localities they occupy? We have seen that the high table-land of Daghestan is covered with deep snow part of the year, to which the Cherkess are less exposed, and the *Lér* and *Lek* tribes of Persia are perfectly exempt: for they quit their cool eyllaks or summer encampments as soon as the cold commences, and descend into the more genial plains below.

The Lesghi also come down at times into the plains, but less with a view of tending their sheep than that of plunder. They come pouring down as a mountain avalanche, carrying terror and dismay before them, and leaving destruction and desolation behind. I recollect, some years ago, when returning from Persia, instead of following the beaten track I struck into the hilly Daghestan, and then entered the plain of the Kúmúks and Nogai Tatars.* On stopping to rest one night at the foot of Kazi-Yúrt, on the river Súlakh, I was struck by an unusual display of hurry and bustle in and around the place, and learnt that information had just been obtained that a party of Lesghi, with Shamyl at their head, had left the hills and were in hot pursuit

* South of, and some miles from, the Terek.—J. S.

of plunder in the plain. Next morning I found that the Kúmúks and Nogai Tatars had sought shelter round the fort, and pitched their tents under the range of the cannon of Kazi-Yúrt, the commandant of which came to announce the unwelcome intelligence that he could not allow me to continue my journey until the coast was clear, namely, as soon as a sufficient number of Cossacks had been collected from the different posts of the cordon-line to force the marauders back into their fastnesses.

My captivity lasted but a few days, of which I had nothing to regret, as I spent it in the pleasant company of the commander of the fort and his good lady, Mr. and Mrs. Bibikoff. The exposed station this distinguished young officer occupied was by no means a sinecure. He had to be constantly on the watch against any sudden attacks of the enemy, and soon after arriving at St. Petersburg the melancholy report reached me that he had fallen a victim to the sword of the enemy. What became of his poor wife, I am ignorant. A short time previous to my visit, the post-stations which had been established between Kazi-Yúrt and the town of Kislár, on the banks of the Terek, leading to Astrakhan, had been destroyed, the postilions killed, and the horses carried away into the mountains, so that I had to hire my cattle from the soldiers of the garrison to take me as far as Kislár, some hundred miles distant. But how could I evince any misgivings for my safety, when I had for my guide on the coach-box of a very primitive sort of vehicle, with three horses abreast, the wife of one of the garrison men,—the high-spirited and intrepid Maria Parlovna? Indifference to danger is often the result of habit, and I have had occasion more than once to witness the wives, sisters, and daughters of the military men in the Caucasus, even mothers, evince a degree of courage and composure in moments of danger, of which one would suppose them incapable if they were less accustomed to look danger in the face. This reminds me of an instance of which I was a witness in the very localities through which we are at present threading our way, and which I may venture therefore to relate as being in harmony with the couleur locale.

When in the heart of the Daghestan Mountains, I visited a fort which had lately been erected on the Súlakh to keep in check a rather turbulent Lesghi aíl or village some thousand families strong, and who were far from being reconciled to their present lot. In order to show me the lions of the place, my hospitable host proposed taking a ride to the village, which was at some distance. Several young officers of the garrison volunteered to be of our party; but I was rather surprised, when the son of the commandant—a mere boy of nine or ten years old—expressed a wish to accompany us, that his mother readily acceded to his request. I do not undertake to affirm whether the maternal heart felt as much composed as the outward features of the countenance seemed to imply, but the veteran major was evidently pleased both with the mother and the son. We crossed the Súlakh by a stone bridge thrown over the deep ravine through which the river winds its impetuous course, and threaded up a steep ascent, having to our right and left hanging gardens enclosed between high stone walls,—Cherkey is known for its vineyards. On reaching the platform on the summit we were soon surrounded by the male population of the village, with countenances anything but prepossessing. We then begged leave to see the interior of some of their sakli or houses, to which they conducted us rather reluctantly. As we entered, the women receded into the interior apartments; only some children, with very expressive eyes, stared at our intrusion. The greater part of the aíl was in a dilapidated state; many of the houses—mostly of slate, sandstone, and boulders—had crumbled by the effect of the cannon when the place had been reduced to obedience, but the inhabitants had not yet had the leisure or the heart to rebuild their dwellings.

On returning to the maidan or open square, we found the villagers in rather

an excited state, and inquired into the cause. They pointed with their fingers to a steep mountain at some distance, from the heights of which proceeded a dense cloud of smoke or dust, with some figures running to and fro.

Was it a razzia contemplated by a neighbouring aúl or tribe to avenge some deadly feud on the devoted heads of the Cherkey inhabitants, now fallen from their high estate? or was it a fanatical party of Múrids, friendly to the people of the place, hurrying to glut their vengeance on the blood of Christians? The Cherkey people were armed with long muskets and daggers,—in fact, the mountaineers never quit their arms. So were we armed; and before the matter could be cleared up we were determined to stand our ground; but we exchanged looks of significance, and it was then that I admired our little companion for his self-composure; at all events he evinced no signs of fear,—perhaps, like Nelson, he had never seen fear. When the cloud dispersed, it turned out that a party of the Cherkey had attacked some of their enemies and carried off a whole flock of sheep, which they were bringing in triumph to their friends.

After all, the adventure proved rather of a Quixotic nature; but it might have been different, and, instead of laughing, as some did, at the absurd occurrence, the inhabitants of Cherkey might have had the laugh at our expense.

In order to give you a clearer insight into the different communities of the hilly Daghestan, and which, after all, can only be an outline, it will better serve our purpose if I name first the principal tributaries of the Súlakh river, which all have their sources in the great chain of the Caucasus; as in so doing I can more easily group these highland clans. Thus, the Koi-Sú, passing through the territories of the Andí, on the western frontier, bears that name; the Koi-Sú, next in succession to the east of the former, traverses the country of the Avars, and is styled the River of the Avars; and lastly, the Koi-Sú coming in the direction of the Kazi-Kúmúks, together with the Kara-Sú, one of its tributaries, forms the eastern boundary of the hilly Daghestan.

All these mountain streams serve to swell the volume and increase the impetuosity of the Súlakh, which flows into the Caspian in the possessions of the Shamkhal of Terki.

The first on the list is the community of the Deedo, who inhabit the almost inaccessible heights from whence the Koi-Sú of the Andí gathers its tributary waters from the great snowy range of the Caucasus. It is only two years ago that the Russian General Baron Vreosky succeeded in penetrating into the recesses of their mountains and opened a line of communication with Kúpro, the principal stronghold of these wild and unruly people. It is rather an interesting fact that, among the ancient tribes enumerated by Ptolemy, you meet with the *Διδουροι* in the neighbourhood of the *Τουρχοι*, the present Tushins, who occupy the Caucasus west of the Deedo tribe.

There exists a curious legend among them, which is mentioned also in the old Georgian chronicles. At the time, it is said, when Alexander of Macedon besieged the town of Mzheth, the ancient capital of Georgia, the natives, after the siege had lasted about eleven months, feeling unable any longer to defend the place, found means of escape by boring a passage through the mountains, owing to the soft texture of the stone, and sought refuge in the country of Deedófi.

Next to the Deedo, along the line of the great chain in the upper course of the Koi-Sú of the Avars, live scattered among the rocks the Antkratl tribes, joined into one confederacy, although broken into numerous small communities, of which it would be fastidious to attempt the enumeration: Tosh, Antzúkh, and Kapucha may be reckoned among the more prominent. Agriculture, as elsewhere in these hills, is carried on on a very small scale. According to Russian prisoners, who have dwelt some time among them, the space of

land a Russian peasant is able to plough in the course of one day is made to suffice a Lesghi family all the year round.

The language spoken here is partly the dialect in use among the Avars (of whom we will speak presently) and partly the Georgian. It may be here observed that the clans have each their different jargons, which are said, however, to spring from one common stock. Klaproth divides the Lesghi language into four principal dialects, but it is to be regretted that the subject has not yet been sufficiently studied.

The country of the Avars lies between the two Koï-Sú of Andí on the west, and the river of the Avars on the east, and although watered by many streams is but poorly cultivated. The inhabitants sow barley, oats, and millet. They dry their wheat, then bruise it, and, after roasting, mix it up with honey and make biscuits thereof, which they take with them on their military excursions, as it is found to be very light and nutritive. We find mention of the Awyr in the ancient Zend text among the inhabitants of the Caucasian mountains. The Avars are sometimes confounded with the Huns and even the Pechunghs. Klaproth finds a great resemblance between the personal nouns among the Huns and the Avars of Hunzah; and, among others, that of Attila or Addilla, which, he says, is a very common name with the Avars of the present day. "Adil," the "Just," in Persian, is sometimes added to that of their chiefs, though God only knows how far they deserve that epithet. The Avars figure largely in the annals of the middle ages, and formed a strong power after the Arabs had converted them to Islam, and up to the present time they are the greatest fanatics among the Mussulman tribes of the Caucasus. But the country of the Avars, and Hunzah, their capital, have become more familiar to the European ear by the novel of Merlinsky, 'Amúlat-Beg,' the English version of which may be found in 'Blackwood's Magazine' for the year 1842.

Klaproth, seeking for analogies between the language of the Avars and the dialects spoken by the natives of Northern Siberia, mentions, among others, that the word *mother*, in the Avar tongue, is *ebel*; with the Ostiaks, *ewel*; among the Samoyeds, *ewel* and *ewya*.

But we may here observe that, among many of the Eastern tribes, the names of Adam and Eve have been retained (of course, with inevitable variations), and usually serve to designate man and woman or mother.

To the north of the Avars we meet the Andí, the country of Gúmbet, and the Koï-sú-bú, which, for fear of detaining us too long, we will dismiss with a passing remark, that the former are good tillers of the land, evince great aptitude in the manufacture of woollens, and show some disposition for trade,—a happy feature which, if it were more generally cultivated among the yet rude mountaineers, would more easily bring about the much-desired peaceful relations between the present masters of the Caucasus and the native tribes of the mountains.

The country west of the Súlahk bears the name of Salataú. It is very hilly, with deep and hollow ravines, but rich in pasture-land and very woody. The vine can be raised with success. We have had occasion to mention already the vineyards of the Cherkey people on the banks of the Súlahk. Although the hills rise in some parts to the height of nearly 8000 feet, the climate is genially warm in the valleys, which produce peaches, and where rice is cultivated.

Salataú has some very fine hot sulphurous springs, which, in all probability, will be better frequented when greater security shall be established throughout this land. The country is also rich in flocks of sheep. It is mostly this portion of Daghestan which has been the theatre of the bloody struggles between the Russian forces in the Caucasus and the Lesghi highlanders, and their strongholds have gradually fallen into the hands of the former.

Thus, Gumri, where Kazi-Mullah, the prophet and mountain chief, fell in 1832, was followed by Ahülko, Dango, and recently Veden, which have successively been abandoned by Shamyi and garrisoned by Russian troops.

In closing my narrative I wish you to understand, my dear Doctor, that not all of it is the result of my own personal observations. I have been essentially aided in this sketch by consulting the materials which have been collected on this interesting branch of ethnography by Mr. Berger, whose position in that part of the world has enabled him to gather correct data about the mountain tribes of the Caucasus, and who, I hope, will not slacken in his praiseworthy efforts of raising the veil which covers many a part of Daghestan, and dispelling the mist still brooding over the hilly regions of the East, fraught with so much interest to the inquiring ethnologist.*

5. *Address to the Geographical and Ethnological Section of the British Association at the Oxford Meeting of 1860.* By its President, SIR RODERICK IMPEY MURCHISON, D.C.L., F.R.S., Vice-President of the Royal and Royal Geographical Societies, and Director-General of the Geological Survey of the United Kingdom, &c.

LADIES AND GENTLEMEN,—During the last two years only, the President of each Section of the British Association having usually opened the business of the Meeting by a short address, it fell to my lot to offer a few words to the geographers and ethnologists who were assembled at Leeds in 1858. I there expressed the satisfaction I felt in proposing, at the Edinburgh Meeting in 1850, the formation of a separate Section for Geography and Ethnology, to occupy the place left vacant by our Medical Associates who had seceded to found an association of their own.

Until that year geography had been attached exclusively to the Geological Section, in which it was almost submerged by the numerous memoirs of my brethren of the rocks, whilst Ethnology, forming a Sub-Section, with difficulty obtained a proper place of meeting. Now, however, both these sciences are, I am happy to say, fully represented; and I trust that the result of the coming week will show, that the subjects to be illustrated will attract so many members to our hall as will prove that Geography, in its comprehensive sense, is as popular in Oxford as it is in the metropolis.

Before I enter upon the consideration of any memoirs which may be laid before us, let me allude to a few of the subjects of deep interest which have been illustrated by British Geographers in various parts of the world in the two years which have elapsed since I had the honour of last presiding over you.

In Africa, the earlier discoveries of that great traveller Livingstone have been followed by other researches of his companions and himself, which, as far as they go, have completely realized his anticipation of detecting large elevated tracts, truly *Sanatoria* as compared with those swampy and low regions near the coast, which have impressed too generally on the minds of our countrymen the impossibility of sustaining a life of exertion in any intertropical region of Africa. The opening out of the Shiré river, that grand affluent of the Zambezi, with the description of its banks and contiguous lofty terraces and mountains, and the discovery of the healthfulness of the tract, is most refreshing

* Since these lines were penned, the military operations on the left flank of the Caucasus have been carried on with so much success by the present General-in-Chief, Prince Bariatsky, that Daghestan has surrendered to the power of Russia.

knowledge, the more so as it is accompanied by the pleasing notice that the slave trade is there unknown, except by the rare passage of a gang from other parts. Again, this portion of the country so teems with rich vegetable products, including cotton, and herds of elephants, as to lead us to hope that the spirit of profitable barter, which powerfully animates the natives, may lead to their civilization, and thus prove the best means of eradicating the commerce in human beings.

Whilst Livingstone was sailing to make his last venture and to realize the promise he had given to his faithful Macololo friends, that he would return to them, and bring them kind words from the Queen of the people who love the black man, Captains Burton and Speke were returning from their glorious exploits in a more central and northern region of South Africa, where they had discovered two great internal lakes or fresh-water seas, each of not less than 300 miles in length.

I may here notice, to the honour of our Government, and particularly to that of the present Secretary for Foreign Affairs, that Captain Speke, associated with another officer of the Bengal army, Captain Grant, has received 2500*l.*, to enable him to terminate his examination of the great Nyanza Lake, under the Equator; and we have reason to hope that he will find one of the chief feeders of the White Nile flowing out from its northern extremity, and thus determine the long-sought problem of the chief source of that classic stream.

I also trust that in the last and most arduous portion of his efforts in proceeding northwards he will be assisted, through the co-operation of Her Majesty's Consul at Khartúm on the Upper Nile, in traversing the country immediately to the north of the Equator, where no traveller, ancient or modern, has ever penetrated, and which is inhabited by wild and barbarous natives. After a residence of sixteen years in that region, and having made many trading expeditions to the confines of this unknown region, that bold and experienced man, Consul Petherick, is, I am persuaded, the only European who can afford real assistance to Captains Speke and Grant; and if by their united efforts the true source or sources of the Nile should be discovered, Britain will have attained a distinction hitherto sought in vain from the days of the Roman empire.

During the week of our meeting, Mr. Petherick will bring before us his project, which I trust you will support,* either for ascending the Nile to its source or affording assistance to Captain Speke, without which it is much to be feared that the gallant officer will never be able to traverse the savage tracts which intervene between the Nyanza Lake and the highest part of the Nile as yet known to any traveller.

If we turn to the Polar Circle, we see what individual British energy has been able to elicit from the frozen north. There, indeed, notwithstanding many a well-found expedition sent out to ascertain the fate of Franklin, all our efforts as a nation had failed, when the energy and perseverance of a woman, backed only by a few zealous and abiding friends, accomplished the glorious end of satisfying herself, and of proving to her admiring country, that in sacrificing their lives her heroic husband and his brave companions had been the first discoverers of the North-West Passage.

For her noble and devoted conduct in having persisted through many years of her life to send out expeditions at her own cost, until she at length unravelled the fate of the *Erebus* and *Terror*, the Royal Geographical Society of London has rightly judged, in awarding to Lady Franklin one of its gold medals, whilst the other has been appropriately given to that gallant and skilful officer Sir Leopold M'Clintock, who in the little yacht the *Fox* so thoroughly accom-

* A Subscription List in furtherance of this great object is opened, headed by Lord Ashburton and Sir Roderick Murchison.

plished his arduous mission. He not only ascertained the death of Franklin, and the subsequent abandonment of his ships, but also showed that the great navigator had discovered vast breadths of Arctic lands and seas which were entirely unknown when he left our shores, and had remained so until the truth was revealed by the expedition of the *Fox*.

The geographer who compares the map of the Arctic regions as laid down by Parry and others up to the year 1845, when Franklin sailed, and marks on it all that he is now known to have added in the two brief summers before he was beset, and then inspects any one of the most recent maps, even up to the year 1858 inclusive, and traces the discoveries made by M'Clintock and his associates, Hobson, Young, and Walker, will see what vast additions to geographical knowledge have been made by the last expedition of Lady Franklin.

Such services are indeed worthy of the highest national reward, and I have, I am happy to say, reason to know that a monument in commemoration of the glorious deeds of Franklin and of his having been the first to discover a North-West Passage will be erected, and that the officers and crew of the *Fox* will receive that recompense to which they are so justly entitled at the hands of their admiring countrymen.

Whilst on this subject I may well express the satisfaction and pride I feel, as the President of this Section, that the officers of the British Association have asked us, the Geographers, to bring forward one of our distinguished men to deliver a lecture on some one of our manifold subjects before the body of men of science assembled at Oxford. As this is the second* occasion since our foundation on which geographical discovery has been considered to be of sufficient scientific importance to occupy the attention of the whole meeting, I rejoice in the fact, and also in the knowledge that Captain Sherard Osborn, so well known to us through his charming 'Arctic Stray Leaves,' and other books, as well as by his laurels won in the Crimea, the Sea of Azof, and in China, is to be the lecturer, and that he who is so experienced an iceman is to give us a sketch of the discoveries of Franklin, as laid open by the last researches of Sir Leopold M'Clintock.

And here I may well say that every justice will be done to any subject connected with the condition of icy seas, including the proposed submarine telegraph by the Faroe Islands, Iceland, and Greenland to Labrador; for never at any of our former meetings have I seen so many explorers met together who have rendered their names eminent through Arctic and Antarctic discoveries. Under their observation the paper which is to be brought before us by Captain Parker Snow of the merchant marine, warmly urging a further search to recover the precious scientific records of the *Erebus* and *Terror*, will be ably scrutinised. The names of Admiral Sir James Ross, Sir Edward Belcher, Captains Ommaney and Sherard Osborn, when united with those of Sir J. Richardson and Dr. Rae, are truly guarantees that the question will have so much light thrown upon it as will either satisfy the public that no additional important results as respects the lost expedition can be achieved, or will stimulate us to fresh exertions. For, though all the Arctic voyagers with whom I have conversed are satisfied that there is now no hope of saving a human life, still every man of science must wish that strenuous efforts should still be made to recover, if possible, some more of the many scientific records of the lost expedition which may have been left in various places around the spot where Franklin breathed his last.

In the vast possessions of British North America much additional knowledge has been gained by the successful explorations of Palliser and his associates

* At the Dublin Meeting (1857), our Associate Dr. Livingstone lectured on his great African discoveries.

Hector, Blakiston, and Sullivan, not only as respects the great fertile prairies watered by the Saskatchewan and its affluents, but also touching the practicability of traversing the Rocky Mountains within our territories by passes lower than any which exist to the south of the boundary of the United States.

At this stage of our inquiries it would be hazardous to speculate on these passes being rendered available for railroads; the more so, as the wild region lying to the west of the Rocky Mountains—*i. e.* between them and those parts of British Columbia which are gold-bearing, and are beginning to be inhabited by civilized people—is as yet an unexplored woody region. We may hope, however, that such routes of communication will be established as will connect the Red River Settlements with the prairies of the Saskatchewan, and these last with the rich auriferous tracts of British Columbia. And if the most northern lines be found too difficult for railway communication, through the severity of the climate and physical obstacles, let us hope that by giving and taking ground in an amicable manner with our kinsmen of the United States, we may be enabled by a more southern railroad to traverse the prairies on either side of the neutral boundary, and then pass down the river Columbia to Vancouver Island. By this operation the great Gulf of St. Lawrence and Hudson Bay on the east may eventually be placed in communication with the noble roadsteads of Vancouver Island and the adjacent mainland on the Pacific. At all events, Britain will doubtless not be slow in establishing communications between the Atlantic and Pacific, first by the electric telegraph, next by ordinary roads, and finally, it is to be hoped, in part at least by railroads.

On these subjects we are to be favoured at this Meeting with a paper by Captain Syngé, in addition to the *viva voce* communications of Captain Palliser and his associates.

Having not as yet had access to many of the papers which are to be communicated to this Section, I can allude to a few more of them only. In a Memoir on the Geographical Distribution of Plants in Asia Minor and Armenia by my distinguished friend M. Pierre de Tchihatchef, you will find some remarkable results as flowing from the long-continued researches of that ardent and successful traveller. After accounting for the absence of some plants and the profusion of others in given localities as dependent on climatal conditions (an example of which is, that the grape there flourishes in one tract at the great height of nearly 6000 feet above the sea), M. de Tchihatchef brings out some striking statistical data, showing the vastly greater abundance and variety of vegetation in Asia Minor, compared with that of any other country. He points out that the plants of five mountains only amount in number to double the entire quantity of British plants, and concludes with an eloquent regret that these classical regions, so blessed by the hand of the Creator, and which in the earlier history of mankind were replete with highly civilised communities, should now, through misgovernment, be the scene of oppression and barbarity.

Another distinguished Russian geographer, M. N. Khanikof, who has explored large portions of Persia and the adjoining countries, will bring before us his maps and descriptions of the mountainous tracts of the countries of the southern parts of Central Asia, where the lofty mountains of Ararat, Demavend, and Savalan form the chief elevations of the region to which we look as the cradle of our race.

But, to revert to subjects connected with Britain, in no portion of the surface of the globe have we made such great and rapid advances as in Australia. Doubtless much of this progress in settlement and civilization, particularly in Victoria, is due to the discovery of those enormous masses of gold which are producing far and wide such powerful effects. But looking to the work of purely geographical pioneers, I can declare that some of the most valuable and daring researches, from the earliest days to the present time, have been completed

wholly irrespective of profits gained through the attraction of the precious metal. The great discoveries of Sturt, Eyre, and Leichhardt were made before the existence of gold was known; and even now, when it is the most seductive of baits to entice the traveller, see what vast regions the brothers Gregory have laid open in Northern, Eastern, and Western Australia, without the recompense of a single yellow nugget. Again: look to South Australia, where gold is scarcely known—at least, in any appreciable quantity—and see what its inhabitants have done in pushing far into the interior, simply to acquire fresh pasture-lands. In contemplating these recent discoveries we read with astonishment of what one individual, Mr. M'Dougall Stuart, has accomplished in so short a time, and of the privations he underwent to realize the existence of fresh-water streams and oases on the borders of the great interior saline desert.

Still more were we surprised when we learned that this great continent, the rivers of which were so long considered to be useless, has had its one mighty stream, the Murray, rendered navigable for 1800 miles. With its affluents, the Darling and Murrumbidgee, this river may indeed be said to have been laid open for 2500 miles, *i. e.* between many new towns which have sprung up in the interior and the sea; and all this by the clearing away of the stems and stumps of trees, the result of ages of decay.

There are now, indeed, in England some of the eminent men, whether governors, statesmen, or explorers of this great colonial region, who will, I hope, before we adjourn, throw fresh light on these recent discoveries.

Having presided for several years over the Royal Geographical Society, it has been my duty to pass in review the progress made by the sons of Britain in different parts of the world, and it has ever been to me a source of the sincerest gratification to watch the rapid strides made by the colonists of Australia, and to observe how they have carried with them all the energy of our race into the land of their adoption. If I traced with deep interest the explorations of their boldest travellers through the bush, and witnessed with delight the working out of that golden wealth, of which perhaps, because I was a Highlander as well as a geologist, I had a sort of *second sight*; or if I revelled in seeing their ports filled with ships and abounding in commerce; not all these attributes have rejoiced me more than the knowledge I acquired that our Australian colonists are truly and sincerely attached to Britain and their Sovereign.

As it is out of my power on the present occasion to advert to all the recent advances in ethnology, I will now only say that, besides many communications from other gentlemen, including Mr. Lockhart's excellent notes on China, my eminent and valued friend Mr. John Crawford will give us two memoirs: the one, 'On the Relation of the Domesticated Animals to Civilization'; the other, 'On the Aryan or Indo-Germanic Theory'; each of which will, I doubt not, be worthy of the President of the Ethnological Society of London.

Let me, however, offer a few general observations on those sciences, to the cultivation of which the business of this Section is devoted. Geography, regarded only as the description of the outlines of the earth and the determination by astronomical observations of the relative position of hills, rivers, and valleys, to be laid down by the topographer on a map, is but the key-stone of that splendid science when viewed in its most comprehensive bearings. For, of how much real value is it deprived if not followed in its train by all the affiliated sciences which relate to the phenomena of our mother earth! How infinitely is the important basis of our science enriched by the descriptions of the animals and plants which, teeming on the surface of our planet, are distinguished by forms peculiar to each region,—such distribution being coincident with relative differences of climate!

Again: as a weatherbeaten geologist, I know full well that the science which I have most cultivated would be void of a foundation, if it did not rest on the principles of physical geography; for much of the labour of the geologist consists in restoring, not in imagination, but by a positive appeal to data registered on tablets of stone, the former outlines of sea and earth at different successive periods, whilst he marks the various oscillations of land and water, as well as the necessary accompaniments of grand meteorological changes.

If, therefore, the geographer is guided to the relative position of his localities by the lights of astronomy, he also knows that accurate observation of all terrestrial changes is of the highest value in enabling his close ally the geologist to interpret and read off the former conditions of the crust of the earth. For, just as geography in its present phase is necessarily connected with ethnology, so its earliest features as a science can best be thoroughly comprehended by the geologist. His is the province to bring to the mind's eye the various relations of land and water through the olden periods, when most of our present continents were formed beneath the sea, and to trace the successive elevations and depressions which characterized epochs long anterior to the existence of man. Even in those remote times, when some lands were elevated and others depressed, we have ascertained that the waters and the earth were occupied by various animals which successively lived and died, to be followed by other and more highly organized races, until at length a being endowed with reason was created.

And when, having gone through all the long epochs of geological time, we approach the period when man appeared, how interesting is it to endeavour to unravel the changes which our lands underwent from that recent geological date when the British Isles formed part of the terra firma of Europe! Then, at a later period, how inciting is it to mark the signs of the commixture of the rudest and earliest works of man with the remains of animals, most of which are now extinct, yet mixed up with others which have lived on to our own day!

Thus, whilst the geological geographer who visits the banks of the Somme, sees such an assemblage of relics beneath great accumulations formed by water (as I have recently witnessed myself), he is compelled to infer, that at the period when such a phenomenon was brought about, the waters which have now diminished to an ordinary small river, rose great inundations to the height of one hundred feet and more above the present stream, and swept over the slopes of the chalk on which the primeval inhabitants were fashioning their rude flint instruments,—when, as I would suggest, they escaped to the adjacent hills, and, saving themselves from the sweeping flood, left no traces of their bones in the silt, sand, or gravel.

This linking on of geology with human history and the works of primeval art comes legitimately under our consideration; and here we have just as full right to discuss and test this question as my dear friends the geologists; the more so, as it was to this connection between geology and history that Lord Wrottesley called the attention of the Association in his Presidential Address.

Then again, as we descend with the stream of time until we reach historical records, the geographer next endeavours to throw light on the marches of the great generals of antiquity and the sites of ancient cities; and then truly the geologist, geographer, and ethnologist become united with the antiquary and historian. Taking our recent British example of the discovery of the Uriconium of the Romans at Wroxeter in Shropshire, where is the geographer who has looked at the mounds of earth which till recently covered that ancient city, and is not convinced that causes arising from the combined destruction by man and natural decay have produced the mass of overlying matter on the shores of the Severn which has hidden from our vision one of the famous Roman towns of Britain? As I have delighted in tracing the sites

of the battles of our great British chief, Caractacus,* and in unravelling the age of those Silurian rocks in which he made the chief defences of his own kingdom, so I can now bring back to my imagination how the legions of Ostorius were reinforced from that Uriconium which has just been disinterred from its earthy covering by the zealous labours of the enlightened antiquary Wright, now a Secretary of this Section.

In this manner we see, that as our inquiries necessarily stimulate us on the one hand to recede to the very earliest traces of man upon the globe, so, on the other, we are led on into that department of art and archæology which connects the present with the past, and are thus enabled to offer to the consideration of our associates and auditors subjects of prevailing and universal interest—subjects which will, I doubt not, be handled with redoubled zest, now that we are again happily met together for the third time in this very ancient seat of learning.

In conclusion, Ladies and Gentlemen, I have now only to congratulate you on the recent rapid extension of geographical science throughout the enlightened classes of our countrymen. Brought up with a profound reverence for the works of God, and a due admiration of the finest efforts of man, those sons of our gracious Sovereign who are of sufficient age to profit by extensive travel are already proving that, in their spirit of adventure, they are true Englishmen. The heir to the Crown, after rambles in our Scottish Highlands and travels on the Continent, is about to quit this his Alma Mater, and, to the great joy of our colonists, to visit North America, and there rivet still more strongly the link which binds the loyal people of those provinces to the mother country; whilst Prince Alfred, after cruising in the Mediterranean, is now sailing across the Southern Atlantic to Bahia, not without having on his way ascended to the summit of the Peak of Teneriffe. The willing co-operation of the last and present President † of the Royal Geographical Society demonstrates that our nobility are as much alive to the vast importance of our subject as the middle classes of the community. On my own part, having laboured zealously in diffusing geographical knowledge among my countrymen, I can give you no stronger proof of my satisfaction than by declaring that my gratification is now complete in seeing that this Section is second in popularity and utility to no branch of the British Association.

The BISHOP OF OXFORD, in an eloquent speech, moved, That the Address be printed; and the motion, having been seconded by Admiral FitzRoy, was adopted by the Section.

* See the Preface to the 'Silurian System.'

† Earl de Grey and Ripon, and Lord Ashburton.

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